

NBSIR 74-550

Report to AID on an NBS/AID Workshop on Standardization and Measurement Services in Industrializing Economies

Michael B. McNeil

Office of International Relations
National Bureau of Standards
Washington, D. C. 20234

Held May 11 - 24, 1974

The Workshop was conducted as a part of the program under the
US/NBS/Agency for International Development PASA TA (CE) 5-71.

Prepared for
Agency for International Development
Department of State
Washington, D. C. 20523

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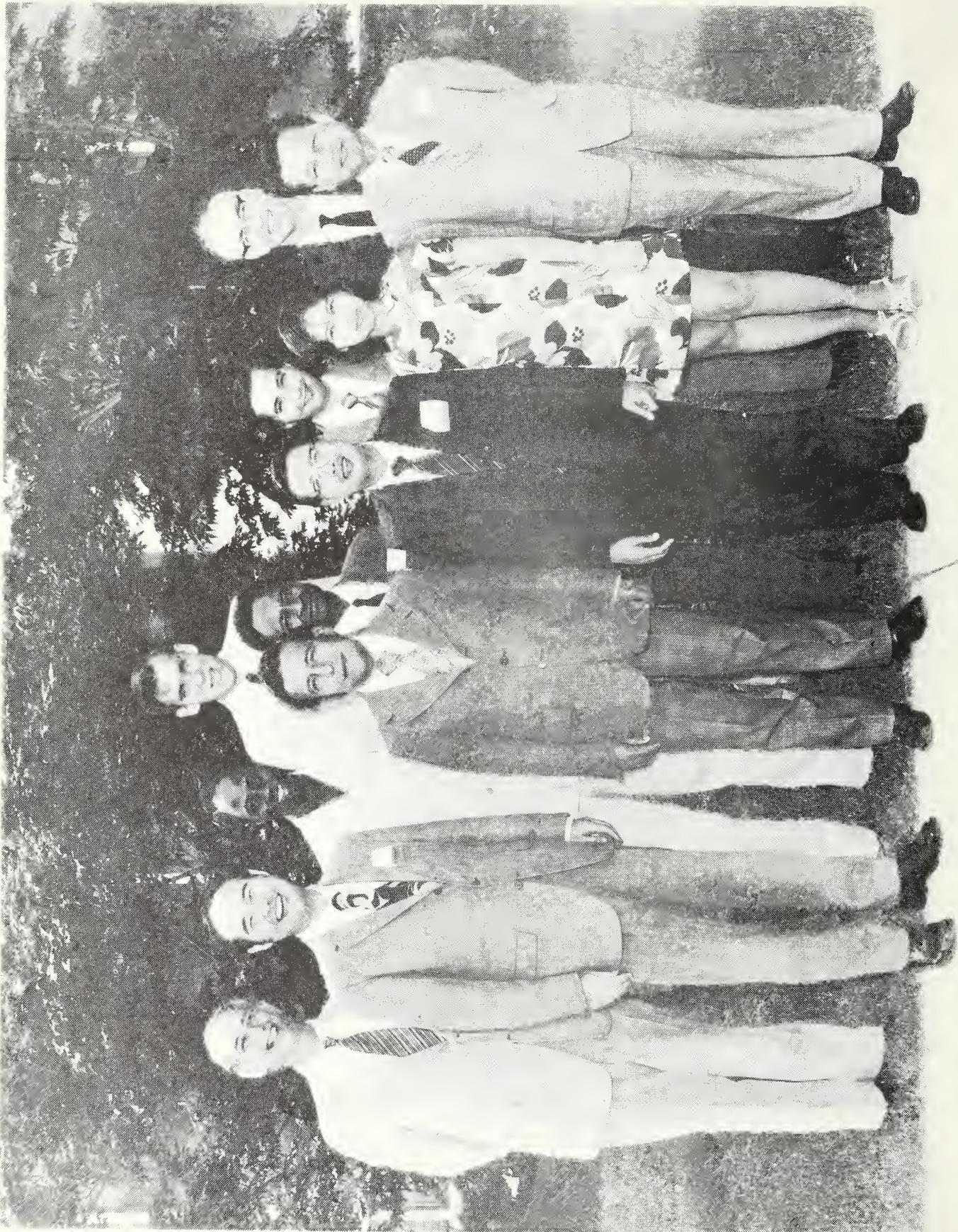
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U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary
NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

FOREWORD

The staff of the Office of International Relations of the National Bureau of Standards desire to thank the Agency for International Development for making this Workshop possible, and to thank those persons at NBS and elsewhere who so freely gave of their time and knowledge to make it a success.



NBS/AID WORKSHOP ON STANDARDIZATION AND
MEASUREMENT SERVICES IN INDUSTRIALIZING ECONOMIES

Group Photograph Taken at NBS Gaithersburg Laboratories

Left to Right:

Mr. H. S. Peiser, Chief, Office of International Relations,
U. S. National Bureau of Standards

Dr. Werner Y. F. Ning, Director, National Bureau of Standards,
Republic of China

Mr. S. I. Ogunmodede, Superintendent of Weights and Measures,
Nigeria

Dr. M. B. McNeil, Assistant to the Chief, Office of Inter-
national Relations, U.S. National Bureau of Standards

Ing. Orlando Donoso T., Director General, General Directorate
of Standards and Technology, Bolivia

Mr. Princewill M. Kanu, Head of Laboratory Services, Nigerian
Standards Organization, Nigeria

Mr. Nguyen Huu Do, Director, National Standards Institute,
Vietnam

Ing. Jaime H. Redin G., Chief, Quality Control Department,
Ecuadorian Institute for Standardization, Ecuador

Mrs. Angeles Mortera, Chief, Technical Division, Bureau of
Standards, Philippines

Dr. E. L. Brady, Associate Director for Information Programs,
U.S. National Bureau of Standards

Mr. Park, Jae Man, Director of Weights and Measures, Republic
of Korea

Not pictured:

Ing. Humberto Rodriguez E., Chief, Quality Control Department,
General Directorate of Industry, Honduras

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Review of Workshop

For several years, the U.S. Agency for International Development and the National Bureau of Standards have had a cooperative program designed to facilitate the industrialization of various countries by helping them to develop a measurement and standards infrastructure. On the part of AID, this is handled through the Office of Science and Technology and, on the part of NBS, by the Office of International Relations.

This program of cooperation contains several elements; two of the most important are the measurement surveys and the workshops.

NBS, under AID sponsorship, acts to help industrializing countries improve their standardization and measurement services by making surveys of their requirements for such services in selected countries; these surveys are generally carried out by a team of experts both from NBS and from other industrializing countries which face problems similar to those believed to exist in the country surveyed. Also, NBS invites representatives of standardization and measurement organizations in industrializing countries to attend workshops held in the NBS facilities at Gaithersburg, Maryland, and at other prominent U.S. standards and measurement services laboratories in which these visitors see what NBS does for the United States and how it interacts with other governmental agencies and with various elements in the private sector.

This report covers the third of these workshops, held May 11 -24, 1974. The participants from abroad were:

Mr. Nguyen Huu Do
Director, Industrial Research and Testing Center
National Standards Institute
Vietnam

Ing. Orlando Donoso T.
General Director of Standards and Technology
Ministry of Industry and Commerce
Bolivia

Mr. Princewill M. Kanu
Head of Laboratory Services
Nigerian Standards Organization
Nigeria

Mrs. Angeles J. Mortera
Chief, Technical Division
Bureau of Standards
Philippines

Dr. Werner Y. F. Ning
Director, National Bureau of Standards
Republic of China

Mr. Jae Han Park
Director of Weights and Measures
National Industrial Standards Research Institute
Korea

Mr. S. I. Ogunmodede
Superintendent of Weights and Measures
Ministry of Trade
Nigeria

Ing. J. H. Redin G.
Chief, Quality Control Department
Ecuadorean Institute of Standardization
Ecuador

Ing. Humberto Rodriguez E.
Chief, Quality Control Department
General Directorate of Industry
Honduras

Fuller information on the participants is contained in Appendix I;
their mailing addresses are given in Appendix II.

The original aims of the Workshop were set out in NBS Report 10583 entitled "Utilization of the Industrial Technology Capability of the National Bureau of Standards" from which the following statement is taken: "Although developing countries may differ significantly from each other in their individual aspirations with respect to industrial development, many of the problems they face in establishing an effective infrastructure of measurement technology and standardization for production and quality control are similar." As a result, standardization experts in most of these countries are interested in sharing their experiences and in learning from each other. During this Workshop, as during the previous similar Workshops, it soon became apparent that a source of major benefit to many of the participants was the opportunity to interact with persons from other industrializing countries having similar problems.

Four distinct aspects of national administration of standards are of special interest to participants:

- a. Maintenance of national standards of measurement compatible with SI, and transference of these standards to local institutions.
- b. Field surveillance of weights and measures in the market place.
- c. Procedures for the development of standards, including standards of safety, consumer protection, building codes, etc., as well as compatibility standards for such things as pipe threads.
- d. Inspection and quality control of production (sampling, tolerances, control charts).

Whereas the emphasis of the first Workshop had been on the prospective "Surveys" of standardization capabilities in the countries involved, only one country represented this year is scheduled for a Survey in the immediate future, and the emphasis this year, as in the second Workshop in 1973, was much more on the communication to participants of useful information about NBS and related institutions.

The Workshop was successful in its objectives of acquainting the participants not only with NBS and its functions and relations with other government agencies, with the various private standards institutions, and with the business community, but also with the complexities of voluntary and mandatory standards in a highly industrialized economy and the possibilities for international transfer of standards and measurement information. The participants also came to know one another and many NBS staff members on a personal basis.

Each participant was asked to describe measurement and standards activities in his own country. These were quite interesting and provided some lively discussions, much of which centered about the interplay between voluntary and compulsory standards.

The Tempo Division of General Electric Corporation contributed a team of speakers to this Workshop. On Monday evening (May 13) Mr. Edward Flynn and his colleagues gave a very extensive presentation on the General Electric Company and its involvement in both U. S. and international standards activities, supplemented by remarks on the functioning of the U.S. voluntary-standards system and its interface with the Federal regulatory agencies.

On Tuesday evening (May 14), Dr. George Manning spoke to the group on the activities of the Battelle Memorial Laboratories, a leading not-for-profit research laboratory; later in the program the Workshop participants visited Battelle's laboratories in Columbus, Ohio.

On Wednesday evening (May 15), Dr. Albert Waterston of American University, a renowned economist and long-time consultant to organizations in many nations on development planning, shared with the Workshop participants the fruits of his scholarship and experience; the text of his talk is published in this Report.

Thursday evening (May 16) and Friday afternoon (May 17), the participants benefitted from lectures by Mr. Fred Dunn on the functioning of the U.S. Department of Agriculture and by Dr. B. M. Gutterman on the Food and Drug Administration. For many developing countries, standards for agricultural products are of great importance, and the addition of these presentations to the program was regarded as of great interest by the participants.

The week of May 20 - 24 was used for laboratory visits away from Gaithersburg and (except for the May 24 visit to the NBS Boulder, Colorado Laboratories) at nongovernmental institutions. Visits to the Martin Marietta Laboratories, the Electrical Testing Laboratories, the American National Standards Institute, Battelle Memorial Laboratories, and Underwriters' Laboratories. A brief visit to the campus of Ohio State University was also included.

The purpose of this program was to permit the Workshop participants to get an overview of the role of independent standards organizations, testing laboratories, and industrial and independent research organizations, as well as universities, in the standards and measurement system of the United States, and to permit the participants to make potentially useful contacts in such organizations.

PROGRAM

NBS/AID Workshop on Standardization and
Measurement Services in Industrializing Economies

May 11 - 24, 1974

Saturday

May 11 A.M.

Check-in Holiday Inn, Gaithersburg,
Maryland

Lunch

Cosmos Club

P.M.

Tour of Museum of History and Technology,
Smithsonian Institution

Sunday

May 12

Tour of Washington

Evening

Barbecue
Presentation on AID/OST Activities by
Mr. J. C. Fry

Monday

May 13 A.M.

Greeting by Dr. R. W. Roberts, Director,
and NBS Overview by Dr. E. L. Brady,
Associate Director for Information Programs

Introduction by Mr. H. S. Peiser, Chief,
Office of International Relations

Plenary Session: Reports by Participants

Lunch

National Technical Information Service,
Mr. W. Knox, Director

P.M.

Program of the Office of Engineering and
Information Processing Standards:

Introduction

W. E. Andrus,
Program Manager

Standards Development
in the U.S.

C. B. Phucas

NBS Voluntary
Standards Program J. A. Koenig

Standards Library and
Contribution to AID
Program W. J. Slattery

Product Certification &
Laboratory Accreditation T. R. Young

International
Standardization W. E. Andrus

International Organization
of Legal Metrology (OIML) D. E. Edgerly

Wrap Up W. E. Andrus

Discussion

Evening Working Dinner, invited speakers from Tempo
Division, General Electric Corporation:
Mr. Edward Flynn et al.

Tuesday
May 14

A.M.

Activities of the Institute for Computer
Sciences and Technology, Mr. E. J. Istvan,
Associate Director for Teleprocessing

Fire Technology, Dr. J. W. Lyons,
Director, Fire Programs

P.M.

Visit to D.C. Weights and Measures Department,
Washington, D.C. Contact: Mr. Kenneth Hayden

Evening

Working Dinner, Invited Speaker from
Battelle Memorial Institute:
Dr. George Manning

Wednesday
May 15

A.M.

Weights and Measures Activities at NBS,
Mr. H. F. Wollin, Chief, Office of Weights
and Measures, and members of his staff

Measurement Assurance, Mr. J. M. Cameron,
Chief, Office of Measurement Services

Lunch

Promotion of Invention and Innovation,
Mr. J. Rabinow, Chief, Office of Invention
and Innovation

	P.M.	NBS Optical Physics Activities, Dr. Karl Kessler, Chief, Optical Physics Division
		NBS Electricity Division Activities, Mrs. Bernadine Dunfee, Electricity Division
	Evening	Working Dinner, Speaker: Dr. A. Waterston, Professor of Economics, American University
Thursday May 16	A.M.	Product Evaluation Technology, Dr. M. R. Meyerson, Chief, Product Evaluation Technology Division
		Activities of the Center for Building Technology, Mr. C. Raley, Coordinator of International Affairs, CBT
	P.M.	Standard Reference Materials, Dr. H. T. Yolken, Deputy Chief, Office of Standard Reference Materials
		Systems Analysis, Mr. J. C. Flannagan, Acting Deputy Chief, Technical Analysis Division
		NBS Information Programs, Dr. E. L. Brady, Associate Director for Information Programs
	Evening	Working Dinner, Speaker: Mr. Fred Dunn, Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service, U.S. Department of Agriculture
Friday May 17	A.M.	Plenary Session (continued). Reports by Participants
		Activities of the American Society for Testing and Materials, Mr. Al Sadler, Assistant to the Deputy Managing Director, ASTM
	P.M.	Food Standards and Methodology Development, Mr. B. H. Gutterman, Assistant Director, Office of Technology, Bureau of Foods, U.S. Food and Drug Administration

Materials Reference Laboratories,
Mr. J. R. Dize, Head, Materials Reference
Laboratories Section

Evening

Director's Reception and Dinner,
Host: Dr. R. W. Roberts, Director, NBS

Tour Conducted by Mr. H. S. Peiser,
Chief, Office of International Relations, NBS,
and Mrs. Mary Depuy, Government Services, Inc.

Monday
May 20

A.M.

Travel to Martin Marietta Laboratories
Baltimore, Maryland

Host:

Dr. David Goldheim

Introduction to MML - A. Westwood

Failure Analysis Using Scanning
Electron Microscopy (SEM) -
J. Venables

Electromechanical Machining (EMM) -
R. Latanision

Technical Services - Corrosion -
J. Green

Copper Hydrometallurgy - N. Levy

Alnor Water Model - H. Obremski

Chemomechanical Effects -
A. Westwood

P.M.

Cement Technical Center -
E. Hurley

Travel to New York City

Night

Edison Hotel, New York, N. Y.

Host in New York:

The International Center in New York, Inc.
Mr. John N. McCormick, Executive Director
Mrs. Pat Droste, Chairman
Visitors Committee

Tuesday
May 21 A.M. Electrical Testing Laboratories

Hosts:
Mr. Charles Hyer
Mr. Don Schrum

Presentations on electrical testing by staff members of Electrical Testing Laboratories, Inc.

Lunch Electrical Testing Laboratories

P.M. American National Standards Institute

Host:
Mr. Claude Burns

Presentations on voluntary standardization procedures by ANSI staff

Wednesday
May 22 A.M. Free

P.M. Travel to Columbus, Ohio

Battelle Memorial Laboratories

Visits to laboratories and pilot plant facilities at Battelle Memorial Laboratories

Evening Cocktails and Dinner as Guests of Battelle Memorial Institute
After-dinner speech, Overview of Battelle Memorial Institute, Dr. Sunderman of Battelle Memorial Laboratories

Thursday
May 23 A.M. Travel to Chicago

Host:
International Visitors Center of Chicago
Ms. Lorraine Schneider, Program Director

Visit to Museum of Science and Industry

Lunch Museum

P.M.

Underwriters Laboratories
Northbrook, Illinois

Hosts:

Mr. Robert van Brunt

Mr. Dennis J. Liston

Visit testing facilities of Underwriters'
Laboratories

Evening

Travel to Boulder, Colorado

Visit to NBS Boulder Laboratories
Host: Dr. L. Y. Beers

Friday
May 24

A.M.

Welcome and Overview,
Mr. R. D. Harrington

Laser Measurement of Gravity and of the
Distance to the Moon,
Dr. J. E. Faller

Applications of Lunar Distance Data to
the Understanding of Tectonic and Earthquake
Mechanisms,
Dr. P. L. Bender

Atomic Frequency Standards,
Mr. R. E. Beehler

International Time Coordination and Clock
Systems,
Mr. R. E. Beehler

P.M.

Executive Session

Cryogenics Overview,
Mr. A. F. Schmidt

Cryoelectronics,
Dr. Robert A. Kamper

Cryogenic Flowloop,
Mr. James A. Brennan
Dr. Michael C. Jones

Electromagnetics Overview,
Dr. H. M. Altschuler

Information Services,
Mr. Wilbur J. Anson

Pyroelectric Detectors,
Dr. Robert J. Phelan

Evening

Farewell Dinner

Host: Dr. Bascomb Birmingham
IBS Deputy Director for
Boulder Laboratory

Mr. Nguyen Huu Do
Director of Research and Testing
National Standards Institute
Saigon, Vietnam

NBS/AID Workshop
on Standardization and Measurement
Services in Industrializing Economies

National Bureau of Standards
Monday, May 13, 1974

THE PROGRAM OF THE NATIONAL STANDARDS INSTITUTE IN VIETNAM

First of all, I would like to convey my gratitude to the National Bureau of Standards and the Agency for International Development for giving me a chance to participate in this professional forum, and also my sincere appreciation to you all who are interested in us.

By way of remarking on the achievements of the Vietnamese Standardization Program in 1973, let me first brief you about our economic background.

1. BACKGROUND: VIETNAMESE ECONOMY 1973

Following the cease-fire agreement signed in January 1973 the Vietnamese economy has entered a new era, that of reconstruction and development.

One of the economic development program's immediate objectives is to foster projects aiming at import substitution and export expansion to equalize the foreign-trade balance. This task requires in parallel increases in industrial investment with improvements in production facilities and techniques to upgrade products' quality.

The Government of Vietnam has established or consolidated a number of Institutions critical for investment promotion such as the National

Economic Development Fund, the Industrial Development Bank, and the Investment and Services Center. In the area of production and quality improvement, the Government of Vietnam has authorized the transformation of the National Standards Institute from a Directorate of the Ministry of Commerce and Industry into an autonomous public Agency, endowed with legal status in order that it may have sufficient means to serve industry more efficiently.

2. NATIONAL STANDARDS INSTITUTE'S ACTIVITIES IN 1973

Against this economic background, the National Standards Institute (NSI) has tried its best and achieved a number of encouraging results. These achievements can be summarized as follows:

2.1 Establishment of National Standards

The Vietnamese industry in its development urgently requires many standards in every field. To gradually satisfy these demands, NSI has collaborated closely with other public and private agencies such as Export Promotion Center, Directorate General of Agriculture, and the Confederation of Craft and Industry of Vietnam to establish annual standardization programs.

In addition, to assure practicability, standards are formulated, deliberated upon, and approved with the cooperation and agreement of different parties with opposing interests, such as the sectors of production, of commerce and consumption, of science and technology, and of public agencies.

In 1973, NSI has given priority for standards on export products: 25 project standards were completed, among which 9 on foodstuffs were promulgated.

As of December 31, 1973, the total number of promulgated national standards amounts to 94 distributed as follows:

. Mechanical Engineering	19
. Electrical Engineering	13
. Chemical Products	13
. Fibrous materials (fabrics, yarns, papers)	22
. Foodstuffs	12
. Agriculture and marine products	6
. Miscellaneous	9
Total	<u>94</u>

2.2 Products Testing

2.2.1 Laboratory Construction

At the beginning, the Government's contributions were very limited, especially for an activity whose objectives are not yet clearly understood, and whose usefulness can only be seen in the long range.

Therefore, with a budget of 14 million Vietnamese piasters (\$US 28,000) received from various public and private agencies, NSI has completed the construction of the laboratory in Bien-Hoa Industrial Park. The Government granted approximately of 7 million Vietnamese piasters (\$US 14,000) at the last stage (Dec. 1972) to complete the construction work.

The USAID financed testing equipment was installed and calibrated from February to October 1973 with the assistance of two American experts who also trained NSI's technicians to operate and maintain these instruments.

2.2.2 Testing Equipment

To economize in this beginning period, NSI has ordered only basic and versatile instruments. When the laboratory has operated for some time and has acquired experience, NSI will procure more sophisticated equipment to build up its testing capability.

2.2.3 Testing Services

Since the completion of its laboratory in November 1973, NSI has provided testing services to industry. The products tested by NSI's laboratory include: soap, sodium silicate, electrolytes, industrial sodium chloride, fish sauce, electric cables, bicycle frames, etc.

With its existing facilities, NSI expects a big advance of its testing program in 1974.

2.2.4 National Conference of Laboratories in Vietnam

The nation in its development needs an adequate industrial and commercial testing system. Except for some medical laboratories, Vietnam has not yet a private laboratory network to provide testing services. Meanwhile, the NSI's testing capability is too limited for products of every kind. In search of solutions for this problem, NSI will pursue two objectives. It will encourage and assist every industrial sector to establish its own laboratory to meet its needs.

In the same time, NSI will proceed to coordinate into one system the existing laboratories in Vietnam for mutual support in providing testing services to industry.

In 1973, NSI has completed a survey on the facilities of the existing laboratories in Saigon and suburban area. The survey showed that most of the laboratories wish to join in the National Conference of Laboratories in Vietnam. With the collaboration of the Chemical Engineering College, the Testing Center of the Directorate General of Customs, and the Nutrition Laboratory of the Ministry of Health, NSI is proceeding with the necessary procedures for the formation of such a conference.

2.3 Inspection for Export

One of the factors that have hindered the Vietnamese products is their low and non-homogeneous quality. Inspecting the commodities prior to export is the most efficient way to raise buyers' confidence and the products' prestige in the world market.

In 1973, in order to formulate a Regulation on report inspection, NSI gathered all information concerning export inspection systems successfully carried out in developing countries such as Taiwan, Iran, and Korea. A Regulation has been drafted and is presently consulted widely among related agencies. It will be submitted to the Government in the 2nd term of 1974 for promulgation. In compliance with this Regulation the Government will designate in priority order export products subject to inspection. The designation of products to be inspected is based on factors such as export amount, product prestige, inspection facilities, etc.

2.4 Certification Marks

Certification marks are expedient to encourage quality improvement. In 1973 NSI has completed the draft of the Regulation for a certification marking scheme and is planning to submit it to the Government for promulgation in the second semester of 1974 after consultation with related agencies.

2.5 Support to the Industry

In 1973, NSI has directly solved for the Vietnamese Industry a number of technical problems relative to use of local raw materials, bettering of production techniques, and quality improvement.

The following industries are among those having received NSI's technical assistance: electric cables, steel wires, rubber products, fish sauce, detergents, and fish meal.

3. CONCLUSION

What I have outlined above are the major accomplishments achieved by the NSI in 1973 under what, I feel, must be the most difficult circumstances. Difficulties are due to limited budget, skilled man-power shortage and also the lack of the in-depth know-how on standardization and measurement technology.

The promotion of standardization and measurement services is a long and tedious undertaking, taxing heavily both the Government of Vietnam and each individual citizen. Moreover, the NSI has to carry out the task in very adverse circumstances. However, with our own effort and with eventual cooperation from friendly nations, I wish to conclude my remarks with a note of optimism for the future for the Vietnamese Standardization Project.

Dr. Werner Y. F. Ning
Director
National Bureau of Standards
Ministry of Economic Affairs
Republic of China

NBS/AID Workshop
on Standardization and Measurement
Services in Industrializing Economies

National Bureau of Standards
Friday, May 17, 1974

STANDARDIZATION AND ECONOMIC DEVELOPMENT

I. Foreword

The policy of the Republic of China since 1949 when the Government moved to Taiwan has always been aimed at constructing Taiwan as a model province for the reconstruction of China Mainland when recovered. During this period, the Government has taken numerous innovative measures such as the fair election system, 9-year compulsory education, the improvement of social welfare, the employment of labor resources, the establishment of laborer's insurance and medical care system, the development of export processing zones, the expansion of international trade and the enforcement of land-to-the-tiller policy etc.* All these

*The Republic of China has carried out one of the world's most successful land reform programs on Taiwan. Countries in Asia, Africa and Latin America send land reform personnel to Taiwan seminars to study the program and observe the results. In the first stage, which began in 1949, farm rents were reduced from an average of 50 per cent to a maximum of 37.5 per cent of the main crop. In the second stage, which began in 1951, public lands were sold to tenant farmers at reasonable prices to be paid in 20 installments over a period of 10 years. The last stage, called land-to-the-tiller, got under way in 1953. Holdings of landlords were limited to 7.2 acres. The government bought up privately owned farmlands in excess of this figure and sold them to tenant farmers, who paid in 20 semiannual installments. Landlords were fairly compensated in crop bonds and stock in four government corporations which then came under private management. Former absentee landholders became entrepreneurs.

efforts have had results which can be illustrated by the facts and statistical analysis. It is especially important in the field of economic development. The successive terms of 4-year long range economic development plans have brought the country a marvelous progress. In 1972, the 5th term of economic development plan is now in progress. Meanwhile, this year the Government launches a giant movement--the 9 construction projects which include construction of a 375-kilometer down island freeway, construction of the Taichung Harbor (the annual volume of goods handled will reach twelve million tons), construction of 82.3-kilometer cross-island railway, construction of a steel plant with a capacity of six million tons of annual steel product, construction of Kaohsiung shipyard which will increase the maximum shipbuilding capacity to approximately seven hundred thousand tons, augmentation of the petrochemical industry, construction of a naphtha cracking unit by phases, elimination of the old type railroad locomotives, electrification of the railway (1,000 kilometers), expansion of Su-ao Harbor and increase of shipping capacity to more than 6 million tons, and construction of an international airport at Taoyuan for the landing of jumbo airplanes. All of the projects won full support from the people of our country. Fruitful achievements are expected.

The facts I have just introduced are the current status of the Republic of China. The subject I am going to present to you is the relations of "Standardization and Economic Development" which will help us understand: How does standardization promote economic development? How did standardization cope with the progress of our long range economic development plans in the past and what was the result? What role will standardization play in future economic development?

II. Metrology, Standards, Trademarks and Patents

No matter how the economic structure changes, human beings will never get away from the scope of metrology, standards, trademarks and patents. Before I touch the subject of the close relations of "Standardization and Economic Development", I would like to discuss briefly the four mentioned operations. To look through historical changes, economic relations came into existence among people in the time of the change from primitive conditions to modern society. The first to come was trading. Metrology is the only means for the arbitration of our trade. Complications in trade have gradually developed a great number of metrological units. In the meantime, owing to the change from the agricultural economic structure to the industrial economic structure, length and mass units alone could not satisfy the actual requirements. Therefore, various metrological units required by the industrial economy were derived from basic units such as temperature, electric current, luminous intensity and time.

These units include pressure, volume, velocity, viscosity, and density. The increase of trading ensues from the progress of industry. So complicated metrological units appear. As industry becomes more precise, metrological units will be more accurate.

The human brain can no longer use only the existing metrological methods to carry out the complicated research of space science and the work must be done by computers. In other words, in order to obtain an ideal objective for scientific and economic development, the metrological units must be more accurate than ever before. It may also be said in this way: if there were no such precise metrological facilities as exist today, we would never have been able to conquer space.

As we all know mass production can reduce the cost of production and the only way to carry out mass production is to conduct standardization of production which can also control the quality of the product. The initial phase of standardization is firstly the product standardization, then raw material standardization, tool standardization, labor standardization, operational standardization and procedural standardization. This is also called industrial standardization.

Industry is not the only element of the economic structure. It comprises everything such as people, time, things, land, and even space. Therefore, the scope of standardization can no longer be limited only to the industrial standardization. It must cover standardization of labor employment, standardization of resources exploitation, standardization of effective use of land, standardization of enterprise management, etc. In other words, everything that the human being touches should be standardized. Only by doing so can the requirements of modern life be satisfied and the future complicated economic structure be coped with. When we talk about standardization today, we must not forget the establishment of new concepts of standardization.

As I mentioned minutes ago, the metrology concept was created in the beginning of trading among people. In the meantime, the commodity marking concept developed when people began to establish their good will. This mark is called a trademark which also serves as a means of advertising and quality guarantee to the consumer by the seller. It has been developed as a basis of trust which can never be dispensed with in the domestic and international trade.

With the growth of industry, the so called big and small enterprises were created. The big enterprises conduct incessant research and development with their immense financial power so as to protect their products on the market. Under such heavy pressure, the small

enterprises also exert strenuous efforts for survival by means of surprising methods such as search for new products and invention of new processes. This type of struggle for survival among enterprises makes patent protection important.

From the facts mentioned above, we will surely know that metrology, standardization, trademarks, and patents are the keystone of the current economic structure and they are closely linked with each other.

The prerequisite for the promotion of standardization is the establishment of metrological units standards. So someone says that the metrological unit standard is the standard of standards. I think it is absolutely correct to say so. To take my country as an example, we established the National Weights and Measures Bureau early in 1908. Its purpose was to unify the national weights and measures and to promote the metric system. Again in 1947 the Industrial Standards Committee was ordered to combine with the National Weights and Measures Bureau and formed the National Bureau of Standards of today. This reorganization fully demonstrates the close relations between metrology and standards.

The promotion of the trademark and patent system is also closely related with metrology and standardization in their actual performance. So our Government placed the four closely related operations under one unit--the National Bureau of Standards. In the view of promoting economic development as a whole, this reorganization is considered as a brilliant success.

III. Change and Standardization in the Chinese Economic Structure

Now I would like to discuss with you the relation of the Chinese economic structure to change and standardization. The Republic of China as you know is an agrarian nation with a history of several thousand years. Until World War I, industry was gradually emphasized by the people. After World War I our policy was that the agriculture assisted in the establishment of industry. This type of structure has continued until the end of World War II. During this period, the promotion of standardization mainly stressed on agricultural commodities such as cotton (CNS 83), tea (CNS 179), raw silk (CNS 87), rhubarb (CNS 85), nutgall (CNS 86), bristle (CNS 84), etc. The standards operations were the establishment and promotion of basic standards such as the trimmed sizes of writing and printing paper (CNS 5), engineering drawings (CNS 3), tolerance and fitting (CNS 4), transmission equipment (CNS 27), and preferred number (CNS 1). Furthermore, standards were also established for the basic and simple tools such as morse taper gauge with flat head (CNS 129), morse taper gauge without flat head (CNS 130), metric taper gauge with flat head

(CNS 127), metric taper gauge without flat head (CNS 128), single headed wrench (CNS 133), socket-headed wrench (CNS 139), screw driver (CNS 144). and pin and washer (CNS 163 to 178). As to the machines, only testing standards were established. The metal standards such as copper, lead, zinc and nickel were also established. The above mentioned activities of standards establishment represent the initial stage of standardization in China.

After the seizure of Mainland China by the Communists, the Government of the Republic of China moved to Taiwan. Based on the existing foundation of the agriculture and light industry in Taiwan, the Government prepared plans for the development of our economy. At first enforcement measures were placed equally on the promotion of agricultural production, processed agricultural commodity production and industrial production. Our standardization operations emphasized processed agricultural products such as canned pineapple (CNS 822), canned mandarin orange (CNS 2341), canned fish (CNS 1219), canned meat (CNS 1128), canned mushrooms (CNS 1250), etc. In the industrial field such standards were established as deformed steel bar for concrete reinforcement (CNS 560), inspection standard of electric lamps for general lighting usage (CNS 298), desk fan (CNS 547), wire code (CNS 31), roofing asbestos-cement slates (general) (CNS 31), compound fertilizer (CNS 3076), solid caustic soda (CNS 43), liquid caustic soda (CNS 430), cane sugar (CNS 206), tires for bicycles (CNS 736), inspection standard of sports shoes (canvas high tops), V-belt (CNS 745), inspection standard for cotton yarn (CNS 702), inspection standard for cotton fabrics (unfinished) (CNS 819), coke for blast furnaces (CNS 1007), and timber (CNS 444); standards were also established for the good of daily necessity such as toilet soap (CNS 594), monosodium glutamate (CNS 297), dental paste (CNS 439), etc. In general, priority for establishment of standards was given to those goods produced in Taiwan which possessed good value for export. Coordination with the related governmental agencies such as the Bureau of Commodity Inspection and Quarantine and Board of Foreign Trade was also made so as to step up the promotion of standardization.

In 1953 the Government of the Republic of China started the successive 4-year long range economic development plans. In order to support the plans, various standards were established aggressively in advance. In 1972, the 5th term of 4-year economic development plans was completed. Five 4-year economic development plans have transformed the Chinese economic structure from agriculture-assisting-in-industry to industry-assisting-in-agriculture. It can also be said that through 20 years of efforts, the Republic of China is now striding toward an industrial era. In 1951 industrial products occupied only 18% of the Net Domestic Product (NDP), while in 1973 this figure rose to 38%. At the present time the population engaged in the industrial production is 1/4 of the total population in Taiwan. In 1952, the agriculture's

share was 36% of the Net Domestic Product; in 1973 it was only 16%. From this, Gentlemen, you can clearly understand the changing of the Chinese economic structure.

Now, I would like to present you a brief analysis and review on the results of the 5th term of economic development plan (from 1968 to 1972) and the achievements gained from the standardization work.

In the first place, I will make a consolidated analysis of the economic growth in Taiwan. The following chart with the statistical figures is from 1968 to 1972 (the end of the 5th term of 4-year economic development plan) for your reference.

Year	Population		G.N.P.	Per capita income	Agricultural production	Industrial production	Transportation & communications
	(1000 pers)	Percentage increase per year					
1968	13,650	2.7	9.3	5.2	6.1	21.0	17.8
1969	14,335	2.5	8.7	5.2	1.0	18.1	14.7
1970	14,676	2.4	11.2	8.9	6.0	17.6	16.1
1971	14,995	2.2	11.5	8.8	2.1	21.0	18.9
1972	15,289	2.0	12.9	8.1	1.9	26.6	13.0

Source: Industry of Free China Vol. 4, No. 1, P. 52, 1973

From the statistics mentioned above you may see some special features as follows:

- a. The growth rate of population was decreased in a slow and steady pace.
- b. Gross national product increased rapidly. To compare the results of the 5th term (1972) of economic development plan with those of the 4th term (1968), the annual increase in rate of increase is 3.6 percentage points.
- c. To compare the per capita income of 1972 with that of 1968, the annual rate of increase gained 2.9 percentage points. During the last 3 years of the 5th term of economic development plan the increase was essentially steady. It shows the economic development plan resulted in the increase of per capita income at a steady rate. It also presents an evidence of the heightening of people's living standard and social stability. The statistics made available in 1972

pointed out that in Taiwan one in every 3.06 families has a record player; one in every 1.57 families, a TV set; one in every 2.88 families, a refrigerator; one in every 7.02 families, a washing machine; and one in every 3.02 families, a motor cycle. All the figures mentioned above give evidence for the increase of per capita income.

d. On the contrary, the agricultural production was unsteady and slightly reduced. This proves the point I mentioned before that the economic structure of the Republic of China has been changing to a state of industrial economy. The increase of industrial production is good evidence of this.

e. The chart shows a big increase of industrial production. (The increase includes, of course, processed agricultural products) which also means that a great number of agricultural laborers were transferred to the industrial production.

Taiwan is a small island (35,961 square kilometers). Since international trade is very important to the island economy, I would like to analyze the status of our exports from 1968 to 1972.

Unit: million dollars

Industrial Products		Processed agricultural products		Agricultural products		Total value of export	
Year	\$	Portion of total export %	\$	Portion of total export %	\$	Portion of total export %	
1968	539.4	68.3	161.5	20.5	88.3	11.2	789.2
1969	776.4	74.0	174.5	16.6	98.5	9.4	1,049.4
1970	1,147.2	80.3	189.6	13.3	91.5	6.4	1,428.3
1971	1,670.6	81.0	225.8	11.0	164.0	8.0	2,060.4
1972	2,498.9	83.1	292.4	9.7	215.4	7.2	2,996.7

Source: Foreign Trade Development of the Republic of China in recent years (1968-1972), 8 (1973).

The above chart shows: (1) The industrial products fraction of exports increased by 14.8 percentage points in 1972 from that of 1968, while processed agricultural products and the agricultural products fell slightly in a steady rate. (2) The total value of export has increased continuously.

The chart gives a good evidence that the economic structure of the Republic of China is entering into an era of industrial economy from that of an agricultural economy. According to the materials I collected, I would like to point out several reasons for your reference:

- a. The increase and stability of per capita income and the good social order constitute a good environment for investment by the foreign business community.
- b. The continuing development of export processing zones results in the increase of industrial production, job opportunities, and good incomes, so as to draw manpower from agricultural fields to industrial production.
- c. Owing to the improvement of the quality of the industrial products, good will has been established in the international market.
- d. Other factors such as the low cost of electricity and the development of transportation are also reasons for industry booming.

Let us now look into the four important economic factors: metrology, standards, trademarks, and patents. First of all, will you please see the following charts:

1) Number of metrological instruments tested and calibrated: The statistics include only tests and calibrations made of precision instruments. The weights and measures instruments used on the market are not listed herein. (In the Republic of China we have established the provincial and municipal inspection offices in charge of the promotion for metric system and test and calibration of weights and measures instruments used on the market.)

Year	Number of Instruments	Total (1968 to 1972)
1968	21,766	
1969	36,210	
1970	24,671	
1971	27,093	
1972	31,568	
		141,308

Source: Report of NBS' Operation (1968-1972), 11 (1973).

2) Number of National Standards established in the past years (including number revised)

Year	Number of National Standards	Total (1968-1972)
1968	189	
1969	211	
1970	333	
1971	270	
1972	544	
		1,547

Source: *ibid.* 9.

3) Number of classified products granted use of Certification Marks

Year	Number of Applications	Total (1968-1972)
1968	97	
1969	61	
1970	60	
1971	49	
1972	72	
		339

Source: *Ibid.* 10.

4) Statistics on the Application for Patents (we have three different kinds of patents which are Patents of Invention, Utility Model, and Industrial Design):

Year	Number of Applications	Total (1968-1972)
1968	2,283	
1969	2,879	
1970	4,218	
1971	4,640	
1972	4,457	
		18,477

Source: *Ibid.* 12.

5) Number of Trademarks registered

Year	Number of Registrations	Total (1968-1972)
1968	4,188	25,663
1969	5,288	
1970	5,771	
1971	5,138	
1972	5,278	

Source: Ibid. 13.

Now, I will make a brief analysis of the charts mentioned above:

1) It is obvious that the statistics show that our operations are increased in keeping abreast with our economic development.

2) The number of standards established in 1970 and 1971 is reduced; this was caused by the two translocations of the Bureau. You can see that after the translocations, the figures are increased.

3) Chart 5 shows that the number of trademark registration and patent applications is not steady; this was caused by our withdrawal from the U.N. and severance of diplomatic ties with Japan and Canada. Now is is restored to normal.

4) The certification mark is the best means to safeguard consumers and promote standardization. From this year we accepted the authorization from the Standards Association of Australia to conduct pre-license inspection and routine inspection on the "AS" Mark goods to be made in our country. It means that in this field we are starting international cooperation.

To compare the economic growth and the total value of foreign trade with the increase of metrology, standards, trademark and patent operations, should not we say that the said four operations are a barometer of the economic development? We also formulated a metrology and standards development plan by years:

a) Metrology: From 1969 to 1972 the number of calibration and test equipment was increased as follows:

Equipment of Weights and Measures

Nomenclature	Description	Accuracy
1. Standards gauge blocks, AA class	PTW Model 103 pcs	± 0.00005 mm
2. Standard gasoline meter for capacity	Measuring Range: 4.9L-5.1L 9.6.L-10.4L 19L-21L	± 5 ml ± 10 ml ± 20 ml
3. Apparatus for wet type standard gas meter	Measuring Range: 2L-33.3L	$0.1M^3/H-5-M^3/H$
4. 1 Kg. precision balance	Capacity: 1000 g Sensitivity: 1 mg	± 1 mg
5. Water triple-point cell		$\pm 0.01^\circ C$
6. Sulphur point boiler		$444.6^\circ C$
7. Antimony point furnace		$630.5^\circ C$
8. Gold, silver, copper point furnace		$1063^\circ C$, $960^\circ C$, $1083^\circ C$
9. Precision bridge for temperature measuring	Measuring Range: $-182.97^\circ C-630.5^\circ C$	$\pm 0.002\%$
10. Precision reading thermometer	Measuring Range: $-60^\circ C-200^\circ C$	$\pm 0.01^\circ C$
11. Low temperature examining bath	" $0^\circ C- -100^\circ C$	$\pm 0.02^\circ C$
12. Thermoregulating oil bath	" $100^\circ C-300^\circ C$	$\pm 0.02^\circ C$
13. Standard KNO system thermometer examination bath	" $300^\circ C-650^\circ C$	$\pm 0.02^\circ C$
14. Thermocouple resistance thermometer tester	" $630.5^\circ C-1063^\circ C$	$\pm 2^\circ C$
15. Optical pyrometer examination equipment	" $900^\circ C-2000^\circ C$	$\pm 7^\circ C$

16. Standard Pt. thermoresistance	"	-183 ^o C-630.5 ^o C	<u>±</u> 0.01 ^o C
17. Pressure gauge tester	"	0-1500 mmHg 0-10 Kg/cm ² 0-20 Kg/cm ² 50-800 Kg/cm ²	1 mm Hg 0.05 Kg/cm ² 0.1 Kg/cm ² 10 Kg/cm ²
18 Standard cell		1.01863V (20 ^o C)	<u>±</u> 0.003%
19. Precision DC potentiometer	"	-0.0000005V -2.11105V	0.01%+0.2V -0.0005%+10V
20. Apparatus for viscosity measurement	"	0-130 ^o C 20cst-8000cst	<u>±</u> 0.005 ^o C <u>±</u> 0.01%

b) Standardization: The standards technical committees were increased from 14 to 23 (there are Civil Engineering and Architecture, Mechanical Engineering, Electrical Engineering, Electronic Engineering, Automotive and Aircraft Engineering, Railway Engineering, Shipbuilding, Ferrous Materials and Metallurgy, Non-Ferrous Materials and Metallurgy, Nuclear Engineering, Chemical Industry, Textile Industry, Mining, Agriculture, Foods, Wood Industry, Pulp and Paper Industry, Ceramic Industry, Domestic Wares, Industrial Safety, Quality Control, Packing and Packaging, and Miscellaneous.) and members of the committee were also increased from 530 to 1,170. They all are experts and scholars of the Republic of China.

c) Trademarks and Patents: The establishment of a complete reference materials system was stressed.

d) Collection of standards information: The collection of standards reference materials from various countries and ISO contains 87,407 items.

e) Education: The text books used in most of the schools use the metric system. Only a very small portion still use both metric system and British system. We also add standards in the curriculum of our junior colleges and vocational schools.

Now I would like to explain to you from another point of view and see whether or not standardization can promote economic development. The following facts will answer this question:

1) The Bureau of Commodity Inspection and Quarantine of the Ministry of Economic Affairs based on the "Law of Commodity Inspection" enforces the "Rules of Practice" of the said law, which

prescribes that inspection of the import and export goods is conducted in accordance with national standards.

2) The Ministry of Economic Affairs promulgated the "Dairy Regulations" which contain all the national standards of dairy products.

3) The Department of Agriculture and Forestry of Taiwan Province formed the "Rules of Practice" for the "Law of Feed Management" which provides clearly that feed be examined according to the national standards.

4) The safety agencies also made regulations in accordance with the national standards in order to maintain safety such as the safety code for liquefied petroleum gas (CNS 1332), for portable extinguishers (CNS 441), etc.

5) The Ministry of National Defense uses some 500 national standards as a basis for procuring common goods on the market.

6) The Tax Bureau of Ministry of Finance prescribes in the "Regulation for Tax Exemption of Goods" in accordance with the national standard for fruit vegetable juices and beverages (CNS 2377).

These are only some examples. Most of the government enterprises or private businesses use the national standards as a basis for their performance. Owing to the nationwide adoption of national standards, the whole economic development was able to make great strides forward in the past years.

IV. Reviewing the Past and Looking Forward to the Future:

I have, based on the 5th term of 4-year economic development plan, analyzed in detail on the contribution of standardization to the economic development. In this paragraph I will, based on the 6th term of 4-year (1973-1976) economic development plan, present to you a brief study so as to help you understand whether or not the standards will be able to meet the future requirements and where they should be strengthened?

Let us look first at the estimates of the 6th term of economic development:

1) Estimates on the per capita income:

Year	Annual Rate of Population Increase (%)	Annual Rate of Per Capita Income Increase (%)
1973	2.0	7.9
1974	2.0	7.3
1975	2.0	7.0
1976	2.0	6.7

Source: Information on Economics (Published by Ministry of Economic Affairs, Republic of China) No. 1 & No. 6, 1973.
(In 1972 the per capita income was \$372.00 and in 1973 \$467.00.)

2) Estimates on Gross National Product Increase:

Year	Annual Rate of Increase (%)
1973	10.0
1974	9.7
1975	9.3
1976	9.0

Source: 6th term of 4-year Economic Development Plan of the Republic of China, (Jan. 1, 1973)

3) Estimates on the Changing of Export Structure (1973-1976):

Item	Average Annual Rate of Increase (%)
Agriculture	1.5
Food Processing	0.5
Manufacture	14.7
Other Services	17.7

Source: Ibid.

4) Estimates of the Increase in Various Fields:

Item	Average Annual Rate of Increase
Agriculture	4.1
Industry	13.1
Mineral	3.7
Manufacture	14.2
Heavy Industry	17.7
Other Manufactures	9.6
Construction	8.6
Electricity and Other Public Works	12.1
Transportation and Communications	9.5
Other Services	8.2

Source: Ibid. 50.

My purpose is by use of charts of the rate of average annual increase to explore the possibility of the 6th term of our economic development plan. The main points for the study of this economic development plan can be consolidated as follows:

1) Agriculture: It stresses the heightening of productivity of the land, especially on fruits, meat, eggs, milk, fish and raw material for industrial use.

Besides, the development of specialized industrial zones and the improvement of production and sales system are also listed as important.

2) Industry: Emphasis is placed on petrochemical industry and electronic industry. The petrochemical industry includes: polyvinyl chloride resin (CNS 1295), polyethylene resin (CNS 2939), para-phthalic methyl ester (CNS being drafted), styrene (CNS 3637), acrylic nitrile (CNS being drafted), synthetic rubber (CNS being drafted), aldehyde (CNS being drafted), octanol (CNS being drafted), acetate esters (CNS being drafted), and polypropylene (CNS being drafted).

The electronic industry stresses electronic parts and components (48 national standards were established and 16 are being drafted). Heavy

industry is emphasized in the shipbuilding industry (18 national standards were established), steel refining industry (78 national standards were established and 11 are being drafted) and precision industry (49 national standards were established).

3) Transportation and Communications: Emphasis is placed on the railroad electrification, container transportation, mechanization of loading and unloading, construction of a down island freeway, expansion of harbors, rehabilitation of the international airport and construction of a local satellite earth station.

4) Others: Development of man power, expansion of export processing zones, establishment of a specialized industrial zone, reclamation and use of tidal land, preservation of water and land development of husbandry.

5) Owing to the change of our economic structure, people swarmed into the big cities, creating many problems. So we established national standards for instant food (CNS 3456), frozen food (CNS 1450, 1451), prefabricated houses (CNS being drafted), and travel safety and pollutions (CNS being drafted).

According to the present status, the direction of our standardization must be adjusted. Therefore, in addition to establishing standards for industrial products and agricultural products, we are accelerating the drafting of many other standards such as standards for transportation facilities, communications facilities, labor resources, and land utilization. In 1973 the following plans were made:

1) Scientific and technological cooperation was made with the Taiwan Power Company and the Chinese Petroleum Corporation. Tests and calibration on electrical equipment and instruments and the establishment of electromagnetic measuring standards and viscosity measuring standards have been carried out. Discussions were held on the drafting of national standards concerned.

2) A 5-to-10-year metrology development plan was made. The use of the following instruments will be increased:

a. Interferometer for absolute measurement of precision block gauge

Max. measurable: 250 mm

No. of block gauge: 9 pcs

Measuring accuracy: $\pm 0.01 \mu\text{m}$ - $\pm 0.04 \mu\text{m}$

- b. Remote controlled precision balance for standard weight calibration equipment
 - 1 Kg. capacity, 1 microgram readability
- c. Flow meter testing apparatus
- d. Standard humidifier

In the meantime, we also, in cooperation with the organizations concerned, try to improve our electromagnetic measuring standards so as to meet the requirements of electronic industry development. This will include:

- a. Basic electrical standards;
- b. Other DC and LF quantities as relevant to radio science and technology, including the calibration of radio devices;
- c. Laser power and energy.

3) Standards: In order to meet the requirement of the broad scope of standardization, we have never stopped recruiting members for standards technical committees. The objective of this year is to reach to 1,200 members in total. The establishment of standards in the future will stress shipbuilding, steel refining, petroleum products, water pollution, air pollution and noise control.

In the future we will use every possible means to collect the newest international standards materials.

4) Trademarks: We will conduct a nationwide check on existing trademarks so as to protect decent businessmen and safeguard the consumers.

5) Patents: We will try to simplify the procedures of application and shorten the pendency examination so as to allow the patented invention to be manufactured in an early date and infuse the economic development with new blood.

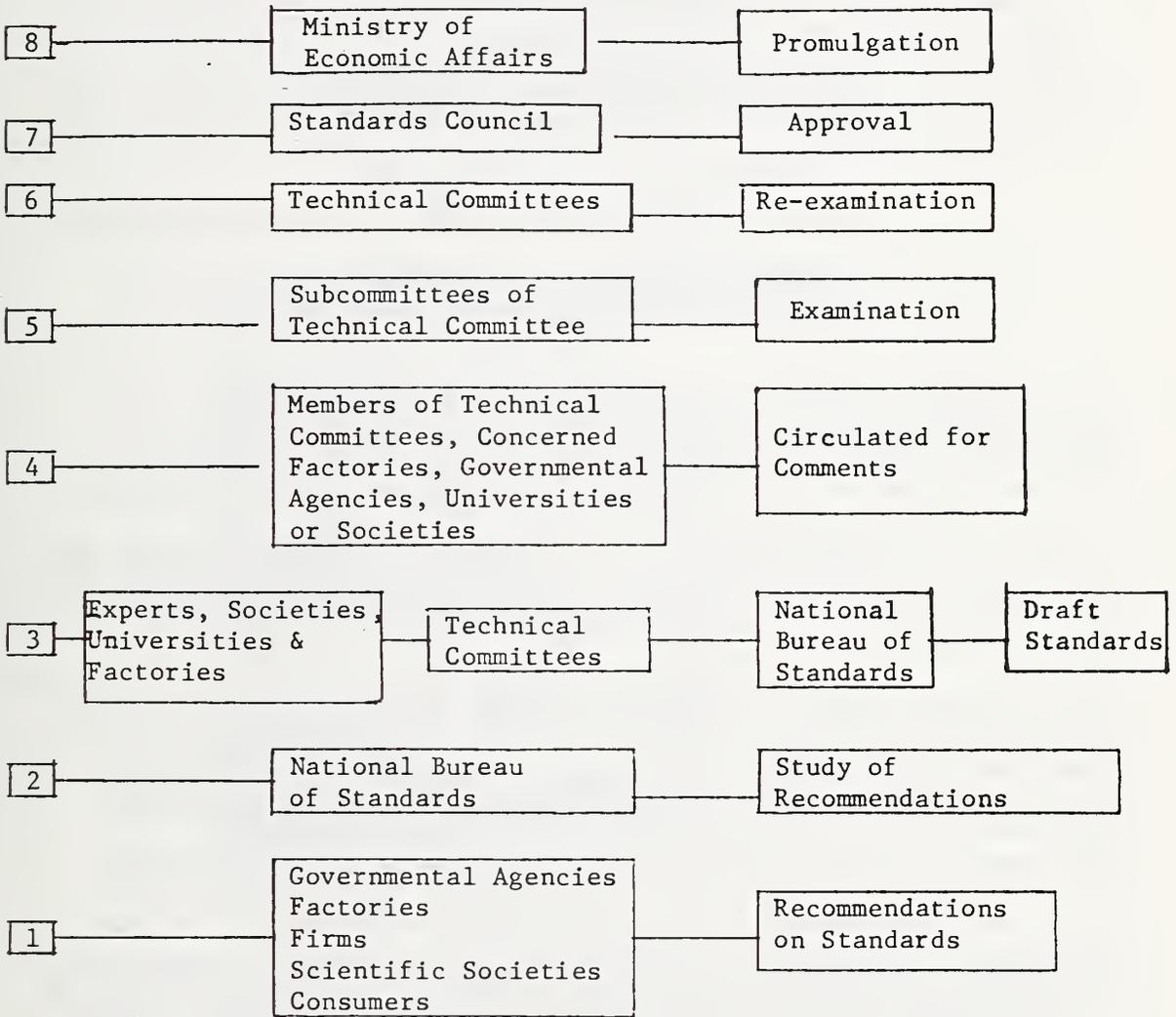
V. Conclusion

Accelerating economic development with the effective assistance of standardization, metrology, trademarks, and a patent system is always our basic principle which serves as a basis for the preparation of our long range standardization, metrology, trademark and patent system promotion plan. Therefore, in the fulfillment of this plan, we need more personnel, financial and material support, and we have planned to augment our existing organization and recruit more experts. We will

also coordinate with other scientific and technological organizations concerned to establish a perfect standardization metrology, trademark, and patent system promotion network so as to establish a strong nation with wealthy people according to our principles, of the people, by the people and for the people.

Appendix: 1. Procedure to establishment of the Chinese National Standards

The procedure for establishment of Chinese National Standards is divided into eight steps:



The adoption of the National Standards by both producers and consumers has been increasing year by year. The total number of National Standards promulgated, from 1949 until June 1973, is 3,433, and the revised standards is 1,592.

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NBS/AID Workshop
on Standardization and Measurement
Services in Industrializing Economies

National Bureau of Standards
Monday, May 13, 1974

STANDARDIZATION AND MEASUREMENT
ITS ROLE AND PROBLEMS IN THE PHILIPPINES

It is my great privilege to be accorded this opportunity of participating in the 1974 NBS/AID Workshop on Standardization and Measurement Services in Industrializing Economies and to present the role and problems of standardization and measurements in my country.

I would like to take this occasion to express my sincerest thanks and gratitude to the U.S. National Bureau of Standards and the Agency for International Development for my country's participation in this important event.

The Philippine Bureau of Standards had not, until recently, taken up standardization of measurements, though in standards covering dimensional requirements, measurements and tolerances on them have been suitably specified. As measurements include other quantities like temperature, pressure, etc. it can be said that these measurements are also covered similar to dimensional requirements.

Last year in the month of May the President of the Republic of the Philippines, considering the developments in the world in respect to metric measurements which had a direct effect on the external trade of the Philippines and also considering the diverse measurements that existed in the Philippines, including the metric system, decreed that the country shall use only the metric system of weights and measures and the change to that system shall be completed by January 1, 1975.

The metric system logically should be called System Internationale (SI) which most countries in the world have accepted and, with the USA changing over to the system, it could be said that nearly 95% of the world's population will have adopted metric system. Standardization, therefore, has to be international in character and we have already some international documents. Notwithstanding the international progress, we in the Philippines had to formulate National Standards which have recently been approved by the Metric System Board. This includes, of course, adapted international standards on definitions of SI Terms, rules for style and usage of the SI System and conversion factors.

Allow me to enumerate here our metric system standards:

1. Definitions of terms in SI System
2. Rules for Style and Usage of the International System (SI) and other related units.
3. Conversion Factors and Tables
4. Commercial Metric Length Measures (non-flexible type)
5. Commercial Metric Steel Tape Measures (winding type)
6. Metric Scales for General Purposes
7. Metric Steel Scales for Engineers
8. Metric, Woven Yarn and Glass Fiber Tape Measures
9. Metric Surveying Chains
10. Commercial Metric Weights (Masses)
 - Part I - Trader's Weights (Masses)
 - Part II - Bullion Weights (Masses)
 - Part III - Carat Weights (Masses)
11. Commercial Metric Capacity Measures
12. Medicine Glasses
13. Dispensing Measures for Pharmaceutical Purposes
14. Kitchen Measuring Spoons and Measures
15. Calibrating Measure for Liquids
16. Graduated Measuring Cylinders
17. Method of Test for the Accuracy of a Dispensing Pump

It would be of special interest for you to note that our Conversion Factors and Tables include, for historical and reference purposes, Philippine units such as:

Weight	-	Picul for Sugar (63.25 kg)
		Cavan for rice (50 kg)
		Sack for rice (56 kg)
		Sack for unmilled rice (44 kg)
		Quintal for tobacco (50 kg gross)

Length	-	Vara (83.6 cm)
Volume	-	Ganta (3 litres)

We had for lumber measurements a unit called board-foot which I understand is also used in the USA. In quest of a suitable new unit to replace board-foot, our Technical Committee in Weights and Measures agreed on "board-metre" with dimensions 1m x 1m x 10mm instead of the converted dimensions for a board-foot. The new unit is 1/100 of a cubic metre and 4 times the volume of a board-foot. It would thus be very 'metric' in measurement and at the same time, being a good multiple of a board-foot, give a concept and feel to the user to help calculate the quantities and cost of lumber.

Measurement, though primarily the concern of our National Institute of Science and Technology (NIST) is also a problem with the Bureau of Standards and other similar bodies. We have planned to become a member of the International Bureau of Weights and Measures (BIPM) and International Organization for Legal Metrology (OIML). We have agreed to entrust to our NIST National Prototypes of Length and Mass together with their measuring equipment and reasonable associated metrology. On the advice of the International Bureau of Weights and Measures (BIPM) we have agreed to have the metre prototypes in special steel, nickel plated. As regards prototypes of the kilogram and other masses, we may procure, again under advice from BIPM, a stainless steel set (except milligram series which could be in platinum). If a prototype kilogram made in platinum-iridium were to be available, our country might use it. We have also planned to equip our National Institute of Science and Technology (NIST) with electrical, frequency, temperature, luminous intensity, pressure, and plane angle standards, while time standards will be maintained by the Philippine Atmospheric, Geophysical Astronomical Services Administration (PAGASA). We have not yet organized a separate Commercial Weights and Measures Department but a proposal to entrust this work to the Philippine Bureau of Standards is being examined by our Government. We have already planned that our Weights and Measures Department should have reference, secondary and working standards of length and mass, and secondary and inspector standards for liquid capacities, together with measuring instruments and supporting metrology.

Estimates on the cost of memberships, prototypes and various other standards, indicate an expenditure of about 1.5 million US dollars but we anticipate that the cost may go over 2 million US dollars ultimately.

As our experience is limited we need help and guidance from other countries having long experience. Assistance is needed and may be in the form of available literature, scientific papers and documents, training for our engineers and technicians, and information on

suppliers of equipment. We have approached UNIDO for financial assistance.

In spite of the problems of finance, lack of trained personnel, etc., the Philippines would like to step forward and keep pace with other countries.

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Director
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National Industrial Standards Research Institute
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NBS/AID Workshop
on Standardization and Measurement
Services in Industrializing Economies

National Bureau of Standards
Monday, May 13, 1974

NATIONAL STANDARDS IN KOREA

First of all, I would like to take this opportunity to express my heartfelt appreciation to Dr. Roberts and his staff as well as members of the AID, particularly for their kindness in inviting me to this important occasion. It is a real pleasure for me to introduce the Standardization and Measurement Services in Korea to all the distinguished participants at this meeting.

In Korea, industrialization has made a smooth progress following the initiation of the Five Year Economic Development Plan in 1962. During the period of the first Five Year Economic Plan, 1962 - 1966, the Korean economy grew at an annual rate of 8.3%. It grew at an annual rate of 11.4% during the second Five Year Plan, which began in 1967 and ended in 1971. During the periods of the third Five Year Plan and the projected fourth Five Year Plan, which will begin in 1977 and end in 1981, emphasis will be placed particularly on heavy and chemical industries. Most of the groundwork for them is expected to be completed during those periods and national per capita income is expected to reach \$1,000 by 1980.

The Korean economy has been suffering from the worldwide trend of economic stagflation caused by the recent oil crisis and lack of

natural resources. However, we are confident that we can overcome this situation through our utmost efforts and close economic ties with friendly nations.

Nowadays, industrialization has two basically conflicting facets. One is a traditional concept of fair competition with neighbors to achieve better living standards and the other is a newly developed idea that a nation is a component of the spaceship called "The Earth."

The concept of "National Standards," which is the cornerstone for industrialization, is too broad and its meaning is not clear. Therefore, I would like to clarify it in my own version by putting it into two main aspects; soft-surface standards and hard-core standards.

Standards specification, standard practice and technological codes, etc. could be included in the group of the soft-surface standards while the measurement standards could be categorized as hard-core standards.

We call the first class written standards. It was initiated in Korea by the promulgation of the Industrial Standardization Law in September 1961. The purpose of this law was to enforce standardization of products as part of a national system. Since then, standardization of industrial products has increased rapidly. As of the end of February 1974, the number of Korean Industrial Standards (basically recommendation standards) reached 3,558 items, which is a relatively great number considering the short history of the national standardization. Such a rapid growth in the number of national industrial standards in such a short period of time is considered to have been largely dependent upon the industrial standards of the advanced and industrialized countries.

As of the end of February 1974, on the other hand, a total of only 272 factories are authorized as the Korean Standards Factories, which entitles them to use K.S. mark on their own products to prove the quality under the Standard Marking System. This represents a small portion of the entire Korean industry, but this is attributable to the fact that a great portion of the Korean industry and the management of their products have not yet been fully modernized. The government has strongly recommended that the private industries apply standardization to their products in order to raise the interests of the manufacturers and consumers. In spite of such positive actions taken by the government, the number of factories producing standardized products is still small due to lack of understanding of standardization and quality control. Therefore, we are now placing much more emphasis on the quality control of industrial products.

The Korean Industrial Standards are being gradually used in purchases of goods by government agencies, in project plans, and in regulations governing export inspections and safety controls. Therefore, it can safely be said that the Korean Industrial Standards have left the stage of importation from advanced countries and entered the stage of maturity at which they can be assimilated as Korea's own industrial standards ready for implementation.

Now, let me turn to measurement standards. Korea is one of the countries which have had their own traditional weights and measures system. This old system has been mainly used for the test and inspection of general measuring devices. However, due to the rapid growth of modern industries, Korea also has begun to recognize the necessity for establishing national measurement standards in order to ensure accuracy and precision and for their dissemination.

In the spring of 1973, the government made a survey on 839 local industries, universities and research institutes with a view to preparing for further development of measurement standards works. The survey was conducted in the form of written inquiries; only 11.2% of the inquiries were answered.

It was revealed by the survey that around 66% of measuring equipment accuracy was reported by responders, but those who did periodical calibration of their measuring devices accounted only for 12%. Of the 12%, most of periodical calibration was made due to enforcement by law so that the instance of voluntary calibration by the users is much lower.

The survey also revealed a very interesting fact that a number of factories which needed measuring equipment of low accuracy were equipped with rather high-accuracy devices. This implies that emphasis is placed upon meeting the requirements of the law while practical quality control is neglected.

It was also revealed that the accuracy of some equipment, for instance, standard cells possessed by the inspection (or testing) agencies for electric equipment, was not closely controlled.

All these factors indicate that there is an urgent need to establish and supply National Measurement Standards which would be a foundation for industrializing Korea as soon as possible.

In January 1973, the Korean Government established the Industrial Advancement Administration (IAA) as the central administrative agency to systematically enforce fundamental requirements for industrialization. In addition, it also established the National Industrial Standards Research Institute (NISRI), merging the former

Bureau of Weights and Measures and the former Industrial Research Institute into one agency, as an organ subordinate to the IAA.

Accordingly, the NISRI now assumes the task of laboratory testing, analysis, and research and development of industrial products, inspection and calibration of weighing and measuring devices (as it previously did), as well as the new task of establishing and supplying national measurement standards.

I am now working in the field of National Standards in Korea and I would like to express my personal views from the standpoint that National Standards are a prerequisite to and an important stimulant for the industrialization of developing countries.

It may not be difficult for the developing countries to imitate and nominally introduce the national standards of the advanced countries; however, it is a difficult task for them to put them into practical use and adapt them to local conditions. First, the developing countries lack social overhead capital such as scientific and technical basic data. Second, since this work is not a profitable business but a work of public interest, it should be conducted directly by the government. However, it is difficult for the government to obtain qualified personnel for its survey and research institutes because of unpopular conditions and low wages.

These two problems cause the difficulties which the developing countries must undergo in the course of their modernization and they can be solved only by the government by giving top priority to this work. To convince the government policy makers to do so, however, is another problem, even with statistical data and other justifications.

I present this problem to you with the hope that some of you might have good suggestions since we all share the same problems.

Nevertheless, the advanced countries could contribute greatly to the measurement standards work of the developing countries by providing mobile calibration service teams to make tours in such countries.

Finally, the most basic and urgent thing for international standardization is the language. Language is a great obstacle to communication among the world people. We should try to solve this problem by a new idea which is entirely different from that of Esperanto previously used. Fortunately, I think today's highly developed knowledge industry and information processing technology can help this project.

It is my opinion that if internationally unified codes were adopted to describe human thoughts and concepts of the objects, the knowledge and

technology of the developed country could be transferred to the developing country very easily. It would not only eliminate the current language barrier but also become a means of sharing the same destiny as passengers aboard the spaceship called "The Earth."

It may sound like a fanciful idea, but I would like to say that it is not just a dream but a possibility which could become a reality if we only tried, and, when realized, could contribute greatly to our standardization work.

Thank you.

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NBS/AID Workshop
on Standardization and Measurement
Services in Industrializing Economies

National Bureau of Standards
Monday, May 13, 1974

STANDARDIZATION AND MEASUREMENT - THE NIGERIAN EXPERIENCE

In recent times few developing countries have shown great interest in the subjects of Standardization and Measurement. This is not surprising in realization of the strong wind of economic change blowing through many of these countries. Most of these changes have had direct bearing on the economic development plans of the countries concerned. The increased tempo of industrialization has, for example, been observable. This has, of course, been taken as an indication of sound economic development planning. Moreover, there has been noticeable, increased consciousness of the impact of standardization in both national and international trade, particularly the latter. Furthermore, as the economies of these developing countries are agriculture-oriented and their main sources of revenue are largely dependent on their exported raw materials, and the amount derivable is again dependent on the quality levels of these raw materials, it is understandable why developing nations should treat these subjects with the utmost sense of urgency that they deserve.

The twentieth century approach to standardization has shed more light on the scientific understanding of it. In effect, this has opened up more vistas of opportunity not only for the developed nations but also posed challenges to the newer nations, which must do everything possible to comprehend the subjects in their ramifications and utilize the knowledge to improve the lot of their people.

The emergence of measurement as a science and its importance on the socio-economic life of nations, particularly the industrializing ones, cannot be overemphasized. It is fitting, therefore, that both subjects should be treated together.

Nigerian Standards Organization (NSO)

The Nigerian experience in standardization is rooted in Decree No. 56 of January 1970, which established the Nigerian Standards Organization as an integral part of the Federal Ministry of Industries and it started to function as of that date. Its functions are, among others, to standardize methods and products in industries throughout Nigeria and to ensure compliance with Government policy on standardization; it acts also as the storehouse for reference standards for calibration of measures and measuring instruments as well as carrying out investigations into raw materials.

The Decree also established the Nigerian Standards Council, members of which are drawn from a broad spectrum of the economy embracing the private and public sectors. It is the governing body of the Standards Organization. The Council is vested with the power to establish Nigerian Industrial Standards as well as to award Certification Marks to manufacturers whose products comply with the established standards

The first and present Director of the Organization is Mr. D. O. Ogun who has worked strenuously with his limited staff to make the Organization what it is today.

Commencing with a big vacuum in qualified staff and faced with public demands for improvement of locally manufactured products at the same time, the Organization, apart from quickly establishing standards in priority areas of the economy, carried out vigorous quality control inspections of industries in the country, recommending improvements in process methods and in the quality levels of products. It has so far set up an appreciable number of standards and specifications in such areas as safety matches, paraffin wax candles, food and drinks, mechanical and electrical products, textiles and building construction.

To ensure compliance with these standards, a certification marking system has been established and it is hoped that this will serve as an impetus to high quality products.

The promotion of metrication as an important aid to the country's ability to compete in international trade was rightly recognized by the nation's economic planners. To this end, the Nigerian Standards Organization was charged with the task of preparing the ground for the effective change over from the imperial to the metric system. The metric system, though recognized as the more practicable and convenient system of measurement, the standard metric system known as the SI (Système International des Unites) has been adopted. This change over, though considered premature by some people, is being pursued in accordance with Government policy on industrialization. Because of

the myriad problems hindering effective change over in some of the heavily industrialized nations, it was thought necessary to metricate before the country became more heavily industrialized. The change over is a gradual process and it is expected that the exercise will be completed by 1977.

Until the promulgation of the Decree establishing the Nigerian Standards Organization, the Weights and Measures Division of the former Ministry of Commerce and Industry had functioned as the only enforcement agency. With the splitting up of the Ministry into two separate Ministries, with the Weights and Measures under the Federal Ministry of Trade and the Nigerian Standards Organization under the Federal Ministry of Industries, a superficial ambiguity in functions seemed to have been created in the minds of some people. But the Decree is clear on the functions of the Standards Organization in respect to metrology. It vests in the Nigerian Standards Organization the power to set up standards in metrology and to maintain reference standards. This implies that standards in use in the country will derive from the Nigerian Standards Organization.

It is incontrovertibly true that the backbone of any Standards Organization is a good standards laboratory, if test and measurement results are to be meaningful. Lack of such laboratories, in many developing countries, due to a number of factors such as inadequate financial resources, bad planning and limited manpower resources, often militate against the attainment of some national economic goals. Although the Nigerian Standards Organization does not have such a laboratory at this time, it has, fortunately, become conscious of the necessity for setting one up in the very near future. For its present activities, however, it does not operate a full-fledged standards laboratory and often works in association with Universities as well as other institutions' laboratories; but the testing facilities thus used have often been found inadequate.

The purchase of reference standards from other national bodies presupposes the existence in the laboratory of essential factors necessary for their effective utilization. Such factors as laboratory design and environmental controls (temperature, humidity, vibration and many others) become of great importance.

Associated with inadequate laboratories are also shortages of staff and training facilities. Shortage of personnel with the requisite qualifications has been one of the major problems confronting the organization; because of the large number of experts required in the various areas in which the organization is interested, rapid expansion has been slowed down. It is in this regard that the U.S.A. with its accumulated experience and advanced state of science and technology is expected to offer invaluable assistance by providing facilities for

training through its many agencies and organizations so that the task of technology transfer will be made easier. It is hoped that the present opportunity offered by the NBS/AID will continue and will be exploited eventually to the mutual benefit of all parties concerned.

I am very grateful to all who have, directly or indirectly, made it possible for me, and indeed for Nigeria, to have this opportunity to participate.

Thank you.

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NBS/AID Workshop
on Standardization and Measurement
Services in Industrializing Economies

National Bureau of Standards
Monday, May 13, 1974

WEIGHTS AND MEASURES ADMINISTRATION - THE NIGERIAN EXPERIENCE

HISTORICAL NOTE:

Looked at from the point of view of its indispensable role in the developing economy of Nigeria rather than its set-up and effectiveness our Weights and Measures Administration is one of the few unobjectionable vestiges of our Colonial heritage. The British influence which was strongly evident in the exclusively Imperial System of Weights and Measures of the 1917-1962 era was watered down by the permissive use of the metric system in the following decade. With the coming into force of the proposed Weights and Measures Decree 1974, Nigeria goes a step further by aligning itself with the Metric World. This of course has generated a number of problems, some of which will be highlighted in these opening remarks.

The maiden Weights and Measures legislation in Nigeria, namely, the Weights and Measures Ordinance dated 9th of August 1917 was apparently a simplified version of the United Kingdom Weights and Measures Act 1878 as amended by the Weights and Measures Acts of 1889 and 1904. It is interesting to note that despite the passing in the U.K. in 1897 of the Weights and Measures (Metric System) Act which permitted the use of the Metric System of Weights in that country, the 1917 Ordinance was uncompromising on the exclusive use of the Imperial System in Nigeria, the strong trade links between the two countries notwithstanding.

For various reasons, the 1917 Ordinance did not serve the purpose for which it was enacted and the much needed metrological uniformity within the country and the unification with the outside world remained elusive. Firstly, there was lack of personnel. The Ordinance was operated by the Inspector General of Police who was the ex-officio Inspector of Weights and Measures, assisted by his Police Officers of the rank of Sergeant-Major and above as Deputy Inspectors. Unfortunately, "at no time was it possible for the Police to bestow on these duties the attention enjoined by law," not even by 1954 when their staff establishment was increased to provide for full-time devotion to Weights and Measures inspection. The increasing commitment of the Police in conventional Police duties continued to make their proper enforcement of the Ordinance impossible.

Secondly, if the commitment of the Police in other directions choked the enforcement of the Ordinance, their lack of basic training in Weighing and Measuring practice and legal metrology finally killed it. The reasons which the architects of the Ordinance had for not prescribing a basic professional qualification for the enforcement officers would not be entered into here. Let it suffice that, while the U.K. Weights and Measures Act 1904 made the BOT Certificate a prerequisite to their Inspectors' appointment and enhanced the administration in the U.K., lack of stipulated basic qualification to operate the 1917 Ordinance in Nigeria virtually made it remain a dead letter.

Thirdly, the Act was limited in scope. No regulations were made under the Act to prescribe tolerances for our Reference and Testing Standards—and it was against those that traders' and other equipment were verified.

POST INDEPENDENCE ERA:

The substantial increase in the number of Police Officers in 1954 was as a result of the growing public awareness to the importance of Weights and Measures administration in the country. In that year, adverse reports were received from abroad of shortweight export produce and claims for compensation made against the Central Marketing Board. This, among other things led to the repeal of the 1917 Ordinance, the promulgation of the Weights and Measures Act 1962 and the establishment of an Inspectorate which was to be staffed with professionally qualified personnel.

Nigeria became independent in 1960, and in 1962 the new Weights and Measures Act was promulgated, which, together with the Independence

Constitution prepared the way for a virile Weights and Measures administration. The Act with the Weights and Measures Regulations 1965 streamlined requirements for the qualification of Inspectors and testing procedures along the lines of International practice while the Constitution classified Weights and Measures administration as an item within the Exclusive Legislative List. All Inspectors in Nigeria were therefore henceforth to be officers of the Federal Ministry of Commerce and Industry with only one Superintendent as head of the service. The arrangement was a welcome departure from the U.K. set-up which has always been based on local government administration with the Department of Trade and Industry only giving necessary guidance. Our post independence era therefore saw a re-orientation of ideas about practical commercial metrology.

The main Act, having sought a professional eligibility for the Weights and Measures Inspectorate, it was left to the Weights and Measures Regulations 1965 to name the Testamur of the British Institute of Weights and Measures Administration as the minimum requisite qualification for the lowest cadre of Inspectors. To pass the Testamur, prospective candidates must undergo a 2-year training programme in the training School in Lagos punctuated by brief periods of attachment to qualified field Inspectors. Eligible Testamur holders proceed to the United Kingdom under the U.K. Technical Assistance Scheme for a further course of study which culminates in the D.T.I. Certificate of Qualification.

In a country with a surface area of 913,075 square kilometres (356,670 square miles) with a population of 56,671,000,* a staff strength of up to 111 Inspectors will be required to provide an Inspector per 500,000 of population. Unfortunately, the present training arrangement has trickled out only 30 Inspectors who, for the performance of their day-to-day inspectional duties have the assistance of some 120 supporting staff.

By 1970, the insufficiency of qualified officers to cope with statutory responsibilities under the Weights and Measures law became apparent and the need for a reorganized training programme evident. The already bad situation was further worsened by the total abolition in the U.K. of the Testamur Examination with effect from 1974. As said earlier the Testamur is the statutory qualifying examination for Inspectors in Nigeria. As if this were not enough, a last straw was added, namely, the split of the one-Part DTI Examination into 2 parts, Part II not to be taken before a year after Part I.

The practical effect of these reorganizations in the U.K. is the creation of a gap in the graduation of prospective Nigerian Inspectors. For this to happen at a time when the country's Weights and Measures Administration is expected to play a very important role

*1963 Census. Provisional figures for 1973 Census gave 79.6 m.

is most inopportune. Now the country is changing to the Metric System of Weights and Measures; the Nigerian Standards Organization is being called upon to formulate numerous new standards and specifications based on the metric system while a newly formed Consumer Affairs Council calls for a consumer protection service. Both home-made and imported pre-packed goods are now to have more meaningful markings. All these mean greater responsibility for the Weights and Measures Inspectorate and call for a tremendous increase in the field surveillance of Weights and Measures in the markets, shops, gazetted produce markets, business premises and factories.

The change-over to the Metric System is of such vital importance in the economy of the country that I feel I would not be doing justice to it if I do not dilate a bit upon it. There is no gainsaying it that the substitution of long-accustomed Imperial and traditional local systems of Weights and Measures by a new Metric System in all spheres of human endeavor could test a nation's intellect and resources. But, like the changeover to the Right Hand Drive and the changeover to the Decimal Currency, the difficulties of the metric changeover are being successfully overcome in Nigeria.

When the Federal Military Government took the momentous decision in 1971 that Nigeria should "progressively abandon the use of the Imperial System of Weights and Measures and other standards in the country and change-over to the exclusive use of the Metric System", every one was happy to join the bandwagon of Russia (1918), Japan (1924), China (1929), India (1958), Iran (1952), and the East Africa countries of Tanzania, Kenya, Uganda (1969) among others which over the last half century have adopted the Metric System. Besides the universal recognition of the system to the extent of being obligatory in over 125 countries and permissive in most of the rest of the world, it is believed that a change was necessary in Nigeria if she "must compete effectively in international business and if her industrialization and education progress will not be impaired".

However, the queer position in Nigeria whereby the Standards Organization is under the Federal Ministry of Industry and Weights and Measures Division under the Ministry of Trade creates a dichotomy of functions in respect of the implementation of the Metric Change-over Programme. The Standards Organization on the one hand, has the statutory responsibility for the change-over, draws up the change-over programme, arranges for publicity materials, drafts and approves industrial standards and awards certification marks. While the Weights and Measures Division on the other hand, by virtue of being the custodian of the Country's primary, secondary and other standards of measurement and because it is armed with the necessary testing equipment and personnel, bears the brunt of the implementation of the changeover programme. It may be mentioned here that NSO Standards must

be traceable to the National Standards. The Division furthermore carries out verifications and inspections of all converted and new metric equipment throughout the 12 states of the Federation, gives lectures to traders, schools and associations, and carries out regular and continuing checks on pre-packed goods. In short, the enforcement of the Weights and Measures Decree including all provisions relating to the field supervision of the Metric change-over is a function of the Weights and Measures Inspectorate alone.

Happily, the necessary cooperation between NSO and Weights and Measures is not wanting and considerable progress has been made. Many sectors including the posts and telegraphs, petrol stations and oil industry, pharmaceuticals, Customs and Excise, and sports have completely metricated. Over 50% of manufacturing industries have also metricated. The West African Examination Council will fully metricate all examinations for schools and colleges by the end of this year.

Having now realized the scope of the responsibilities of the Weights and Measures Administration and the constant extension of its activities to newer fields, one sees that the main problem therefore is how to train a sufficient number of Inspectors to meet the Country's need. As Dr. Adegayo Adedeji, the Federal Commissioner for Economic Development and Reconstruction said on the occasion of the 13th Independence Anniversary of Nigeria, "...there is no gainsaying the fact that an efficient and highly productive public Service is a sine qua non for rapid economic development in any society, particularly in one such as ours where government intervention is in the increase. If our rate of development is not to be slowed down, public services have to be provided efficiently and promptly."

The capacity to provide necessary and efficient staff to meet the challenges of new or added responsibilities or both lies in the formulation of a progressive training programme. It was therefore with this in mind that the proposition to "grow our own trees" is felt to be a sound one. It is hoped that with the assistance of the West African Examination Council, local technical institutes or universities and experts in weights and measures from abroad, a local examination and Examination Board will be established and a fresh content of training determined.

It is at this juncture that I say that I hope that any experiences gained at this well-timed workshop will be of immense benefit to me and my Country. During the workshop, I hope to see and know more of the different aspects of Standardization, and in particular, during the visit to D.C. Weights and Measures Department, Washington, D.C., a specimen of other similar institutions in this great country, I look forward to acquainting myself with the general set-up of your Weights and Measures Inspectorate; the operation of your consumer protection

service; your training and/or qualifying procedure for Inspectors; maintenance, and your upkeep and calibration of Standards and the testing of more advanced packaging machines and bulk metering devices

These, coupled with interactions between participants from countries with similar problems, presentations by Experts and guest speakers and exchange of ideas on cooperation are expected to offer worthwhile ideas on my training and other problems. This opportunity to attend the 1974, NBS Workshop is therefore a fulfillment of a desire to benefit from the expertise of your more advanced country on the one hand and the experiences of fellow participants on the other.

I am therefore most grateful to the NBS and AID for making this workshop possible and for extending to me and my colleague their invitation to learn about the wide but interesting subject of Standardization and Measurement Services in economies akin to my Country's.

Thank you.

MESSAGE

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It is always a welcome augury when advanced nations make a voluntary effort to assist the not-so-advanced countries in their struggle for advancement. For, it is only through mutual give and take at the international level that man can hope to achieve the one world of Wendell Wilkie's dream which we have all come to share.

The present Workshop is but another one of the thousands of examples set by the USA in this direction. Many an advanced nation has followed and is following in the American foot-steps. More recently even some of the countries among the developing world are beginning to make their individual experience and resources available for the benefit of those sister countries which may not be quite in the forefront of progress. Examples of India and Iran in this connection are noteworthy.

This particular Workshop happens to be dealing with a field of work which has been of particular and personal interest to me for more than a quarter of a century. Standardization during this period has made great advances. At one time, it was considered merely hand maiden to engineering practice and to a much lesser extent to management. Today, standardization has begun to pervade all fields of economy, agriculture, education and even administration both in the public and private sectors. Developments have indeed been so far-reaching that standardization has come now to be widely recognized as a newly developing independent discipline, with its own philosophy, theory and practice. True, it has a multi-disciplinary base but there is a great deal of its own identity and individuality, a good part of which has already been developed but a greater part still remains to be explored.

In this Workshop, you will have an excellent opportunity of being introduced to this new and exciting discipline and its multifarious aspects and to learn how it can help accelerate and facilitate the development of your own respective countries. It is my hope that in due course, you will yourself be able to make original and valuable contributions to the advancement of the theory and practice of the new discipline which you have chosen to pursue as your life work.

With best wishes for every success in your endeavours.

Special Workshop Discourse

WHAT DO WE KNOW ABOUT PLANNING?

Albert Waterston

Professor of Economics
The American University

The phenomenal spread of national development planning since the end of World War II has left few countries without some kind of plan or planning organization. Before the War, only the Soviet Union planned its development systematically. Although a few countries began to plan in an organized way soon after the end of World War II, it was only within the last decade, and especially in the second half of the decade, that the diffusion of development planning became worldwide. Today, the national plan appears to have joined the national anthem and the national flag as a symbol of sovereignty and modernity.

In Asia, every country but one has had a development plan. In Africa, every nation has formulated a development plan. In Latin America, the Alliance for Progress -- whatever else it may have done -- caused all Latin American countries to establish or strengthen their planning machinery and to give more attention to the need for development planning. In Europe, almost every nation -- the more advanced as well as the less advanced -- plans in one form or another. In fact, among the more industrialized nations of

the world, only the Federal Republic of Germany and the United States of America have not taken steps to engage in national development planning.

In the face of the worldwide spread of development planning, it is reasonable to ask what we know about planning and what we have learned from experience. But if the considerable accumulation of planning literature is examined, little will be found about the actual problems encountered by countries which attempt to plan their development. Most writers on planning have been primarily interested in the techniques for getting the highest possible returns from the allocation of economic resources rather than in the results actually obtained. They have thus been largely concerned with how planning ought to be practiced rather than with how it is practiced.

Recently, a few studies have appeared which deal with problems encountered in planning the development of individual countries. But none of these studies has attempted a comparative analysis of the planning experience in a sufficiently large number of countries which could, for example, support valid generalizations about the kinds of planning which have been shown to work well and the kinds which have not; the forms of planning organization which have been found to be most effective for promoting development and those which have not; planning pitfalls encountered in the formulation and implementation of plans; whether, indeed, countries have been found to need plans or central planning agencies to achieve and maintain high rates of development.

THE STUDY

In an attempt to determine when, how and why planning has been successful and unsuccessful, and to draw relevant lessons of wide applicability from the experience of countries which have been more or less systematically planning their development, a small group assembled, classified and analyzed planning data of countries throughout the world. The materials used came from published and unpublished sources and covered well over 100 developed and less developed countries in Africa, Asia, Europe and the Americas, including socialized as well as mixed-economy countries.

With these data as the basic raw material, a comparative, empirical study was completed and published by The Johns Hopkins Press as a book of over 700 pages under the title Development Planning: Lessons of Experience. The study is divided into two parts. The first part includes a description and analysis of the planning process as revealed in the experience of the countries under review. Considerable attention is given to problems of plan formulation, but because problems of plan implementation have been found to be the most intractable ones, the greatest emphasis is given to them. The first part of the study lays the substantive foundation for the second part, which contains an extensive discussion of the experience of countries in establishing organizations and administrative procedures for preparing and implementing development projects, sectoral programs, and regional and national development plans.

Although theoretical and other points of view found in the literature on planning are presented for each topic covered, the approach is essentially inductive. As was to be expected, wide discrepancies between theory and practice were frequently encountered, and this led to attempts to reconcile the two. Sometimes, the resolution required proposals for changing practice, but at other times it seemed more appropriate to recommend adjustments in theory. The approach used can be illustrated by reference to two of the study's findings: one with respect to the type of plan known as a "rolling plan," the other with respect to the optimal duration of development plans.

A rolling plan maintains a plan period of constant length throughout its life. For example, for a five-year plan, this may be accomplished by adding a year at the expiration of each year of the plan period. In this way, the five-year period is maintained as the plan rolls forward in time each year. Most planning experts strongly advocate the use of a rolling plan because of its many advantages, which include assurance of plan continuity and flexibility. Yet the study disclosed that for cogent technical and political reasons, no country has actually adopted the rolling plan technique. In this case, it was possible to suggest ways in which practice could be brought into line with what seemed to be sound theory.

In the case of the duration of plans, however, the reverse appeared to be desirable. Most theorists have opted for medium-term plans of five to ten

years. But experience has clearly demonstrated that most less-developed countries do not know how to plan effectively for a period of much more than three years and many cannot plan for more than a year or two at a time. The study therefore suggests that, in at least some countries, theory may have to give way to the experience encountered in practice.

THE LESSONS OF EXPERIENCE

Learning From Other Countries

In the space available here, I should like to indicate some of the more important lessons drawn from the planning experience of the countries included in the study. The results of the study indicate, firstly, that while countries about to start planning their development can learn much from the planning experience of other countries, few make effective use of this experience. Partly, this is because the experience of other countries is not always known; but mostly, it is because countries refuse to be guided by the experience of other countries, since they consider their own political, economic and social conditions to be unique.

Yet the study reveals that most countries not only encounter the same planning problems, but make the same mistakes. Thus, they frequently confuse the mere formulation of a plan with planning, prepare plans with surprisingly similar defects and fail to take adequate account of what can be done (and hence plan for less than is realistic in some sectors and more than is realistic in others). They have their planners take on extraneous tasks which divert them from planning, set up unsuitable planning machinery in the wrong places, and so forth.

When, for example, the draft of the monograph, Planning in Morocco, already mentioned, had been completed, a colleague in the World Bank who was about to write on planning in Spain, borrowed it. He said that he realized that Morocco's planning problems were likely to differ greatly from Spain's but that he only wanted to see how the subject had been treated in the monograph. But he telephoned soon after to say that all he had to do to adequately describe Spanish planning problems was to substitute Spain wherever Morocco was mentioned in the draft.

But while one lesson is that a country can learn much from the planning experience of others, another teaches that there are dangers in the uncritical adoption by one country of the planning machinery and practices of another. Here, limited experience can be worse than none. Thus, Singapore, an island only 26 miles long with an unemployment problem, once invited a foreign expert to help set up its planning organization. The expert's experience, although long, was largely limited to India which, it need not be stressed, is somewhat larger than Singapore and has perhaps more complex problems. The expert's recommendations naturally drew on his Indian experience. In fact, the planning organization he designed was so large that one might have been led to suspect that he sought to solve Singapore's unemployment problem simply by absorbing the unemployed into the planning organization!

What may happen when a less developed country adopts a more advanced country's planning system has nowhere been revealed better than in Morocco. Soon after independence, the Moroccans abstracted from the French government structure its complex planning apparatus and transplanted it almost without

change in their own country. But the French system worked poorly because Morocco was not equipped to make effective use of a planning system which depended on a well-coordinated public administration operating under broadly agreed and consistent directives. In less developed countries at the beginning of their development, a much simpler system of planning than the French is indicated. It would not be surprising, therefore, if some other countries which have adopted the French planning system also find it unsuited to their needs. For example, Tanzania has copied the French system, complete with modernization commissions, in a country where a slight variation in rainfall can make a major difference in output.

Recent successes of the French planning system have made it particularly attractive to other countries. The French system of "indicative" planning, involving the use of so-called "modernization" commissions which perform important tasks in the course of plan preparation, is based on cartelized industries, much of it nationalized, public investments which approximate half of the total investment in the country, along with a nationalized credit system and government controls over private industrial financing, a weak trade union movement, a tradition of close cooperation between business and government and a civil service of unusual competence. Few less developed countries can lay claim to a similar set of circumstances.

Plans Versus Planning

There can be little question that planning has promoted development in many countries. But even when the intangible values of planning are added to the more tangible ones, postwar planning history reveals that there have been many more failures than successes in the implementation of development plans.

Indeed, the record reveals that among developing nations with some kind of market economy and a sizeable private sector, only one country -- Yugoslavia -- appears to have fulfilled reasonable plan targets over an extended period of years. In the early 1960's, even Yugoslavia fell so short of attaining its plan targets that it had to abandon its five-year plan.

By far the great majority of countries have failed to realize even modest income and output targets in their plans except for short periods. What is even more disturbing, the situation seems to be worsening instead of improving as countries continue to plan. Thus, in Asia, where countries have had more experience with planning than those of any other region, the rates of growth in the early 1960's have fallen short not only of planned targets but also the growth rates of the 1950's. The situation is not very different in other regions. In Africa and Latin America, few plan targets are achieved.

While most countries with development plans have not succeeded in carrying them out, some countries without national development plans or national planning agencies have been developing over extended periods far more rapidly than most countries with them. For example, Mexico between 1940 and 1955 (and even until now, since in fact it has no plan to which the Government adheres) maintained an annual average rate of growth of 5-6 percent. Israel, which had no plan before 1961 and still does not have one which the Government follows, has been able to maintain an even higher growth rate. Puerto Rico has become a showcase of development without benefit of a development plan. And among the more developed countries, Germany without plans has increased income and output at least as rapidly as France with plans.

It could be contended -- as I do -- that if these countries had had development plans they might have done even better. But of course, this is not the same as saying that a development plan is necessary to ensure rapid growth and it certainly is not a sufficient condition for development -- as witness the large number of countries with plans which are not developing at a satisfactory rate. The fact is that a country can develop with or without a plan. One might say that countries which grow rapidly without development plans are nevertheless planning in the sense that they are guided by more or less rational programs of action designed to achieve their development goals. These programs of action may be coordinated through budgets for public investments and through a series of government policies more or less designed to stimulate private investments along certain lines.

It is clear, therefore, that a development plan is not the same as development planning. Those who equate the two -- and they are many -- confuse what should be -- but frequently is not -- a product of the planning process for the process itself. Development planning as a process involves the application of a rational system of choices among feasible courses of investment and other development actions based on a consideration of economic and social costs and benefits. Planning as a process is an indispensable precondition for the formulation of effective development policies and measures. A plan can play an important part in the planning process when it makes explicit the basis and rationale for planning policies and measures. But if a plan is prepared before the process has begun in earnest or if it is unable to generate the process, it is likely to have little significance for development.

Importance of the Political Factor

Why are so few development plans carried out? Examination of the available evidence makes it clear that in countries with development plans, lack of adequate government support for the plans is the prime reason why most are not implemented successfully. This lack of support manifests itself in many ways, among which the failure to maintain the discipline implied in plans and the failure to adopt appropriate policies and measures to implement them are most important.

History demonstrates that where a country's government is reasonably stable and its political leaders give development high priority, the country generally develops even when there is no formal plan. Conversely, in the absence of political stability, and firm and continuing government support, development plans, no matter how well devised, have little chance of being carried out successfully. The cardinal lesson to be learned from the planning experience of developing countries is that sustained governmental commitment is a sine qua non for development. Pakistan's planning experience, for example, gives dramatic evidence of the overriding importance of government support. Although the planners of Pakistan's First Five Year Plan produced a development plan with targets well within the limits set by available economic and financial resources, the Plan could not get very far without the help of the Government. Given that support from a strong and stable leadership, the Second Five Year Plan overfulfilled its main targets and objectives.

The experience has been similar in other periods and countries. In the 19th century, Japan, with fewer resources than Burma, China, India or Indonesia

(it had only skilled manpower and waterpower), nevertheless became the most industrialized country in Asia. In large part, this was made possible because of sustained effort supported by a determined government. In the 20th century, the histories of such diverse countries as Mexico, Israel, Yugoslavia, the U.S.S.R. and China (Mainland and Taiwan) give ample evidence of the importance of firm and continuing support from a stable government for the development of a country.

One hears much about the need to find ways and means to imbue the people of this or that country with an understanding of their country's plan and to evoke their desire to participate in the planning effort. But another problem precedes this one: How can political leaders be made to become more deeply committed to the economic development of their countries? Political leaders often give other matters higher priority than they give to development and planning. Among these other matters are nationalism, internal politics, defense, territorial expansion, the formation of international alliances or power blocs, and short-run economic problems. It may be that at some time in a country's history, one or more of these may be more important for a country's immediate welfare or future than its development. But it must be recognized that the relegation of development to a subordinate place in the scale of values of a country's political leaders cannot help but depress development efforts and, hence, the results of development planning.

Economic Incentives

History reveals that until the political leadership of a nation becomes deeply committed to development, the people are unlikely to show much interest in national planning objectives. If a country's leaders make development one

of their central concerns, experience shows that the people can be interested. But except temporarily, for example during or immediately after a war or other catastrophe or upheaval, experience shows that people are unlikely to become concerned with development objectives through appeals to their patriotism, devotion to abstract ideals or altruism, or through panegyrics for accomplishments. Direct government controls over economic activity or threats of imprisonment or other punishment are also generally ineffective.

The evidence teaches that the best long-run method of eliciting behavior which conforms to planning objectives is to make it profitable for people to act in ways required to achieve these objectives. Where governments have replaced restrictive administrative controls by well devised and adequate economic incentives, the results in accelerated economic activity have usually been too clearly linked to the change in approach to be misunderstood. In Pakistan, for example, government officials as well as competent outside observers agree that administrative restraints seriously hampered industrial growth during the First Plan period. They also agree in attributing the high rate of industrial progress during the Second Plan period largely to the reduction of government controls over imports and foreign exchange and the introduction of a system of tax incentives and bonuses which encouraged businessmen to expand plant capacities and output. In Pakistan's agriculture, also, the use of incentive prices played an important part in increasing production.

Yugoslavia has had extraordinary success in the use of economic incentives in its socialized enterprises. Since the early 1950's, when it replaced centralized controls based on the Soviet model with decentralized management of the economy, Yugoslavia has evolved a system of general economic incentives

based on appropriate tax, credit and price policies by which workers and enterprises are rewarded largely in accordance with their efficiency in increasing quality and output. These incentives have proved to be so effective in raising production that other Eastern European countries, notably Czechoslovakia, but also Poland and Hungary and even the U.S.S.R., are adopting major elements of the Yugoslav system.

In contrast, many governments in countries with mixed economies persist in relying on direct controls and administrative intervention in the private sector in preference to incentives, often with depressive results for their economies. India has frequently been cited as a country where government controls exercise an inhibiting effect on development. There are also many others in the same category. The problem therefore seems to be one of getting the mixed-economy countries to adopt the system of economic incentives that the socialized countries took over from the mixed economy countries.

Separation of Plan Formulation from Implementation

If, as indicated, the foremost reason why plans are not carried out is political, the second most important reason is technical. From the technical point of view, the failure to carry out plans is largely attributable to the omission in most plans of adequate provision for their implementation. The late Prime Minister of India, Jawaharlal Nehru, who as Chairman of the Indian Planning Commission manifested an uncommon grasp of planning problems, once pointedly remarked: "We in the Planning Commission and others concerned have grown more experienced and more expert in planning. But the real question is not planning, but implementing the Plan . . . I fear we are not quite so

expert at implementation as at planning . . . " This statement is notable not only because it recognizes -- correctly I think -- that the problems of plan implementation are more difficult than those of plan formulation but also because it distinguishes -- wrongly I believe -- "planning" from "implementation."

The word "planning" is often used, as it was used by Prime Minister Nehru, to refer to the formulation of plans, but not to their implementation. The conceptual separation of "planning" from "implementation" is more than a question of semantics: it is symbolic of an attitude which prevails widely among planners. Nevertheless, experience shows that nothing is more conducive to bad planning than the separation of plan formulation from provision for implementation. Planning cannot leave off where plan formulation ends and action to execute a plan begins. Every target must be accompanied by policies and measures which have been devised specifically to fulfill it -- otherwise it becomes only a forecast or a projection.

Where plan formulation is viewed as an exclusive or isolated element divorced in practice if not in theory from plan implementation, as it has in fact been viewed in many countries, one finds that planners pay little attention in their plans to the choice of means to be employed to achieve plan targets. This is why most plans provide detailed information only about what is to be achieved, but not about how to go about securing development objectives or targets or about who should be responsible for carrying out the required tasks. The case of Nigeria's National Economic Plan for 1962-68 is illustrative of the widely held belief that a plan comes first and that measures to implement it can be postponed until after the plan has been accepted and put into effect.

Policy changes needed to achieve the planned allocation of resources and to implement targets were not included in the Plan; instead, they were left to be initiated at a later time by the ministries concerned with the various programs.

Many planners consider that their job is finished when they have prepared a plan and that it is up to others to work out the detailed policies and measures needed to implement the plan. This attitude is reminiscent of the solution to the World War I enemy submarine menace proposed by some forgotten wit who suggested that the temperature of the Atlantic Ocean be raised to the boiling point to make life for the submerged submarine crews unbearably hot. In this instance, too, implementation was left to others.

The organic link between the targets in a plan and the policy and other measures required to attain them is a concept which many planners and political authorities find difficult to grasp. There is frequently a lack of understanding in developing countries that investment is not enough to insure growth; that the adoption of appropriate policy, administrative and organizational measures is frequently more important for accelerating the rate of growth than increased investment.

Most plans are prepared in central planning agencies whose officials have little authority to influence instruments of economic policy and administrative measures formulated elsewhere. Consequently, one often finds countries where tax, price, monetary and credit policies impede rather than help realize plan objectives. For instance, in Pakistan, agricultural price policy discouraged farmers from planting crops whose output the First Plan sought to increase.

Planners, mostly trained as economists, are understandably more concerned with the internal content and consistency of their plans which embody problems of interest to economics, than in plan execution, which is largely an administrative and political matter. When things go wrong, as they often do, planners divide into two main groups: One tends to believe that better planning depends on further improvements in imperfect planning techniques; they therefore busy themselves with more advanced model-building exercises (e.g., curvilinear instead of linear programming), simulation and input-output technique, operations research, the theory of games, etc. The second group tends to feel that the shortcomings in the planning process reflect inadequacies of the administrative and political environment within which plans must be implemented rather than deficiencies in planning technique. But whatever their position, planners are little likely to concern themselves with the problems of public administration and politics.

Discounting Overambitious Plan Targets

Of course, a planner cannot do much about a government's administrative inefficiency and its lack of political commitment or will to develop. But if in preparing his plans he ignores these critical factors, which together constitute the main limitations on the ability of most less developed countries to realize their economic possibilities, he ends up by separating his activities and the plans he formulates from the real world outside a national planning agency.

This is precisely what happens in most less developed countries. National development plans in these countries are formulated on the basis of a country's

economic potentialities or its needs as determined by population growth and are little related to the country's administrative capacity to carry out the plans or to the government's will to implement them. In these countries, therefore, plans are not so much blueprints as hortatory instruments of propaganda. It can hardly be surprising, therefore, that most plan targets are never achieved. Because the targets are fixed on the basis of what is possible or desirable instead of what is likely, they usually are set so unrealistically high -- not in terms of economic potential or need, but in terms of administrative capacity and political will to develop -- that they never have much chance of being fulfilled. For instance, in the case of Bolivia's Ten-Year Development Plan for 1962-1971, the target for average annual increases of 9.2% in GNP in the first five years of the plan period may have been economically possible, given available financial and other resources; but it was far beyond the country's administrative and political capacities. No wonder the plan was quickly discarded as overambitious.

If planners are to set realistic targets in their plans, they must somehow find means to measure quantitatively administrative inadequacy and the lack of political will to develop for the purpose of "discounting" the overly optimistic results obtained when plans are formulated solely on the basis of economic potentiality. It may not be easy to obtain these measurements, but it is not impossible. For example, it is possible to quantify the cost of administrative inefficiency, in terms of money and time, on the basis of past discrepancies between original estimates and actual performance for projects and programs in different sectors. These data, which are available wherever projects and programs have been carried out, can be used to adjust cost and

time of construction estimates furnished by sponsors of projects and programs where their previous estimates have been shown to be overoptimistic. By deflating the estimates by a factor based on their past errors, such adjustments can go a long way toward closing the gap between promise and performance.

Similarly, it is possible to quantify a country's political will to develop if a government indicates, before a draft plan is prepared, what measures it proposes to adopt on important policy matters which could accelerate the projected rate of growth. If planners set up for each major policy area (e.g., in taxation, credit, investment, money and incomes) feasible alternatives from which political authorities can make a choice before a plan is drafted, planners can determine the combined impact of these choices on the rate of growth, and construct their plan accordingly. In the process of selecting the alternatives which suit them most, political authorities will be supplying concrete and specific information about the extent to which they are prepared to adopt policies and other measures for furthering development which, collectively, can be said to constitute a veritable measure of their "will to develop."

If the three basic elements which enter into the planning process -- economic potential, administrative capacity and political will to develop -- are all taken into account in plan formulation, plan targets are bound to be more in line with a country's real capacity to achieve its economic potentialities. These targets are likely to be lower than those which now are found in most plans. But this may not be a bad thing since the lower targets would expose the restrictive effects of administrative inefficiency and political inaction on economic potential. Hopefully, this might lead governments to improve economic

policy and public administration. Even if it did not produce this result, it would make possible a distribution of development resources more in line with the practical possibilities for implementing a development plan. In this way, the separation which now exists in most countries between plan formulation and implementation would be reduced if not eliminated.

The Projects Problem

The current artificial separation between plan formulation and implementation accounts for the failure of planners concentrating on the macro-economic, aggregative or overall aspects of planning to recognize soon enough that the basic weakness in most developing countries is not the lack of an elegantly integrated comprehensive plan based on economic potentialities, but the inability to prepare sound projects, carry them out and operate them efficiently after completion. In Argentina, Bolivia, Chile, Guatemala, Morocco, Nigeria, Pakistan and in many other countries, planners found after they had prepared their plans that there were not enough projects available to carry out the plans they had fashioned with great care. For example, after 18 months of work on Bolivia's Ten-Year Plan, the planners found themselves in the embarrassing position of conceding that "the principal deficiency that will be noted in the formulation of the present Plan is the small number of specific investment projects . . ." needed to execute it. Similar statements can be found in the plans of other countries.

Because it usually takes several years to identify and prepare good projects in the quantities needed to implement a plan, it is too late for planners to become concerned about them after a plan has been prepared or even when it

is being formulated. If little has been done long before to start sector, feasibility and engineering studies for projects, there is not much planners can do when a plan is being formulated except to note the lack of projects and programs needed to carry out their plans. This is why it does little good to prepare a macro-economic plan with growth targets which promise much unless pre-investment and investment studies are sufficiently advanced on the projects needed to give effect to the plan targets.

It is not very hard to devise a development plan for most countries in the early stages of development. The sectors with the highest priority are usually agriculture, transport and electric power. In some countries another sector may be equally important. For example, in Saudi Arabia, Libya and Venezuela it would be petroleum, in Liberia it would be iron ore. But in almost every case, the basic sectors are few and easily recognizable. Experience with Iran's Second Seven-Year plan, as well as with others, suggests that rule-of-thumb distribution of available resources among basic economic sectors, when needs in every one of them greatly exceed available resources, is unlikely to yield appreciably worse results than distribution determined by careful and prolonged macro-economic calculations. As a rule, it is also easy to select the highest priority projects in each sector because they are generally well known. The problem in most countries is not so much to find high priority projects in quantity as it is to prevent the dispersion of available resources over too many projects.

Coordination of investment through the budget, although not as desirable as through a plan, is often feasible. If a plan is considered desirable, it does not have to be a comprehensive plan for six or ten years which may require

2 or 3 years to prepare; the evidence reveals that in most countries, a partial plan covering the public sector for one, two or three years, which can be prepared for most developing countries in a few months, will not only suffice to get things going in the right direction, but will do so more rapidly than a comprehensive plan. Any imbalance and waste which may result from partial planning is likely to be more than outweighed by accelerated gains in output and income. This is a lesson of experience in countries with long planning histories. France, India, Pakistan, the U.S.S.R. and most other socialized countries began with partial plans and the results obtained indicated that they were justified in starting with partial planning. The preparation of a plan is therefore not an unduly difficult problem.

Most less-developed countries run into great difficulties, not in formulating plans, but in preparing and carrying out projects and in trying to operate them efficiently. In part, this is because planners are better versed in the broader macro-economics of model building than they are in the micro-economics of project selection and preparation; in part, it is because operating organizations in most less-developed countries do not know how to prepare sound projects; and in part, it is because it takes much longer to prepare many projects needed to implement an aggregative plan than to formulate even an elaborate comprehensive plan. Thus, it may take five years merely to establish whether there is enough water for a hydroelectric project at a given site. More than three years have been spent in preparing a study of the route where the Pan-American Highway will cross the rain forests on the borders of Panama and Colombia. Preparation of important projects may take up to ten years.

But few projects are carefully worked out before construction begins. As a result, many projects and programs are not carried out at reasonable cost and

in reasonable periods of time. Attempts to reduce the time spent in project preparation frequently result in the choice of low-yield projects; substantially increased costs and delayed construction because of unanticipated technical or other problems; poor phasing of raw material, transport, staffing or other requirements; failure to provide adequate financing; shoddy construction; and inability to make full use of completed projects.

Few less developed countries are fully aware of the need for selecting soundly conceived projects with potentially high yields, defining their scope with clarity, estimating their national currency and foreign exchange requirements with a sufficient degree of accuracy, and laying down realistic schedules for their execution; fewer yet have the administrative capacity and the political will to cope with these needs and, especially, to carry out the projects and programs in accordance with carefully developed programs of action.

CONCLUSIONS

Changing the Planning Mix

One reasonable conclusion to be drawn from experience, therefore, is that it may be desirable to reverse the usual proportions of the planning mix in most developing countries. Planners in these countries have almost invariably concentrated on aggregative planning rather than on the proper preparation and execution of projects. As indicated earlier, the empirical evidence suggests that countries with well-prepared projects coordinated by sound budgetary procedures and controls can dispense with comprehensive plans, at least for a time, and still maintain high rates of growth. Conversely, when well-

prepared projects coordinated by sound budgetary procedures and controls can dispense with comprehensive plans, at least for a time, and still maintain high rates of growth. Conversely, when well-prepared projects or sound budgetary procedures are lacking, even a good aggregative plan is of little value in bringing about a significant acceleration in the rate of development. Since the proper preparation of good projects and effective budgetary controls thus appear to be indispensable to rapid development and a plan does not, it is clear that improvements in project preparation and budgetary controls, where needed, are at least as urgent as the preparation of aggregative plans.

It is obviously desirable for countries to prepare an aggregative plan, as well as to improve project preparation and budgetary controls. But governments in less developed countries have only limited ability to undertake these tasks simultaneously. Experience shows that where governments try to do all three at the same time, improved project preparation and execution, as well as budgetary betterment, almost always give way to the preparation of an aggregative plan.

Changing the Planning Sequence

These findings obviously have important bearings on the sequence with which planning problems ought to be attacked in newly developing economies. If the primary objective is improvement in the planning process rather than the preparation of a comprehensive plan, planners cannot start, as they frequently do, with a series of theoretical abstractions of planning as it ought to be and try to force them on an inhospitable environment where governments are unstable, not genuinely committed to development or otherwise unready for advanced planning. Instead, while not forgetting the long-run objectives that

theory teaches as desirable, they must attempt to mold their plans to "things as they are," at least at first. This implies that greater emphasis be given to micro-economic aspects of planning, to sound policy formation and improved organization for coordinating investment, rather than to the preparation of neatly integrated macro-economic plans.

Improving Planning Organization

Since projects and sector programs, to be effectively executed, should be prepared in operating agencies, organization of programming units in these agencies should get much higher priority than they now have in many developing countries, perhaps even higher than central planning agencies. Improved budget offices may also be more important in these countries than improved central planning agencies.

Changing Technical Assistance

The findings in the study also have important implications for foreign technical assistance. The type of technical assistance needed for preparing technically and economically sound projects, and executing and operating them, differs from the type of technical assistance needed for aggregative planning. Aggregative planning largely requires the use of economists who have a modest knowledge of agricultural and industrial technique; but project preparation requires engineers, agronomists and other technicians who have acquired only enough competence in economics to be able to accurately estimate the economic costs and benefits of the projects they prepare.

Because the preparation, execution and operation of projects involves many people in a government, it becomes imperative that foreign technical

assistance be largely made up of teachers rather than "doers." "Doers" can be used for a few special purposes, but only teachers working "on the job" with groups of government employees actually engaged in project preparation and execution can hope to train in a reasonable period the large numbers of workers who must become involved in project preparation, execution and operation.

The shortage of foreign technical assistance in some countries has probably been exaggerated. There is often a much greater shortage of officials who know how to make effective use of technical assistance. Indeed, too often, there appears to be an attempt on the part of some governments to substitute foreign technical assistance for their lack of political will to develop. Nonetheless, the overall scarcity of competent foreign technicians is real enough to suggest that a basic reorganization in their use is indicated if more effective use is to be made of them. But this opens an entirely new subject which it would be well to let lie for now.

Appendix I

Biographical Data

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NBS/AID Workshop on Standardization and Measurement
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May 11 - 24, 1974

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Appendix II

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